01428

ORDER NO. MTC9205471F1
B1

Service Manual

Color Television

CTP–1050R, PC–11A50R

Model	Chassis
CTP–1050R	ALNDP215
CTP–1061R	ALMDP215
PC–11A50R	YALNDP215
PC–11A61R	YALMDP215

(NA1)

Main Manual

1948

CTP–1061R, PC–11A61R

The service technician is required to read and follow the "Safety Precautions" and "Important Safety Notice" in this manual.

Specifications

Power Source:	120 volts, 60 Hz, AC
Power Consumption:	1.0 amp max.
Antenna Terminal Impedance:	1–UHF/VHF 75Ω input
Channel Capability:	155 Channel (Phase 14 Modified Synthesizer)
Off the Air:	VHF 2~13, UHF 14~69
Cable:	99 Channels
Sound Output:	1.25W (10% distortion)
Earphone Jack:	1/8" Jack
AC/DC Power Input 12V Car Battery:	DC power consumption 7 AMP max. (CTP–1061R, PC–11A61R)
Video Input Jack:	1V p–p 75Ω, phono jack type
Audio Input Jacks:	500mV RMS, High impedance–10k
Remote Control:	Infra–red system EUR641576 (White) (CTP–1050R, PC–11A50R) EUR641036 (Black) (CTP–1061R, PC–11A61R)
Picture Tube:	10" diagonal (11" Canada) 90 degree deflection A26JGZ91X
Anode Voltage:	23.75kV max. (zero beam) 22.5kV ±1.25kV
Dimensions:	Height – 10.6" (269mm) Width – 10.3" (262mm) Depth – 13.0" (330mm)
Weight:	15.5 lbs. (7.0kg)

Specifications are subject to change without notice or obligation.
Dimensions and weight are approximate measurements.

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Important Safety Notice

There are special components used in this television set which are important for safety. These parts are "BOXED" on the schematic diagram and printed in **BOLD TYPE** on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X–RADIATION, shock, fire or other hazards. Do not modify the original design without the permission of manufacturer.

Safety Precautions

General Guidelines

An ISOLATION TRANSFORMER should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

When servicing observe the original lead dress, especially in the high voltage circuit. In case of a short circuit, replace every part which has overheated.

Always REPLACE PROTECTIVE DEVICES, such as fishpaper, isolation resistors and capacitors and shields after working on the receiver. Use only manufacturers recommended rating for fuses, circuit breakers, etc.

High potentials are present when this set is operating. Operation of the set without the rear cover involves the danger of electric shock from the set's power supply. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high–voltage equipment.

Extreme care should be used in HANDLING THE PICTURE TUBE. Rough handling may cause it to implode due to atmospheric pressure (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure in removal or installation. When handling, use safety goggles and heavy gloves for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging, go from cold ground (i.e. dag ground lead) to anode with a well insulated piece of wire.

Avoid prolonged exposure at close range to unshielded areas of the picture tube. Possible danger of personal injury from unnecessary exposure to X–ray radiation may result.

The TEST PICTURE TUBE used for servicing the chassis at the bench should incorporate a safety glass and magnetic shield. The safety glass affords shielding from the tube viewing area against X–ray radiation as well as implosion protection. The magnetic shield limits X–ray radiation around the bell of the picture tube in addition to restricting magnetic effects. When using a picture tube test jig for service, ensure that jig is capable of handling 31kV without causing X–radiation.

BEFORE RETURNING A SERVICED RECEIVER **(of any type)** TO THE OWNER, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER WHEN MAKING THIS TEST.

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and each exposed metallic part such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. When the exposed metal does not have a return path to the chassis, the reading must be infinite.

Leakage Current Hot Check (See Figure)

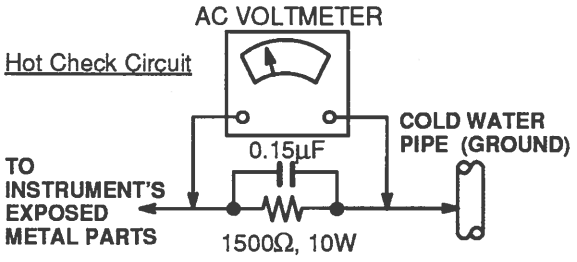
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15µF capacitor between each exposed metallic part and ground. Use an earth ground, for example a water pipe.

Using an AC voltmeter with 1000 ohms/volt or more sensitivity, measure the potential across the resistor.

Move the resistor connection to each exposed metallic part and measure the voltage present.

Check that any potential does not exceed 0.75 volt RMS. A leakage current tester (Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above hot check, in which case any current measure must not exceed 1/2 milliamp. In case any measurement is out of the limits specified, there is a possibility of a shock hazard and the set must be repaired and rechecked before it is returned to the customer.



X–Radiation

WARNING: The potential source of X–radiation in TV sets is the High Voltage section and the picture tube.

NOTE: It is important to use an accurate, periodically calibrated high voltage meter.

Adjust BRIGHTNESS, PICTURE, SHARPNESS and COLOR controls to Minimum.

Measure the High Voltage. The high voltage meter should indicate 22.5kV (±1.25kV). If the upper meter indication is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Osc. Disable Circuit Test

This test must be made as a final check before the set is returned to the customer. See HORIZONTAL OSC. DISABLE CIRCUIT PROCEDURE CHECK in this manual.

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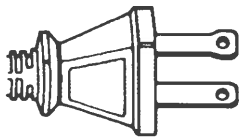
Followed by the Remainder of Schematics on 1 Separate Large Pullout Sheet.

Installation

AC Models

Insert (Polarized) plug into 120 volts 60Hz standard AC outlet. Do not defeat the safety purpose of the polarized plug.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADE CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.



Polarized Plug

AC/DC Models

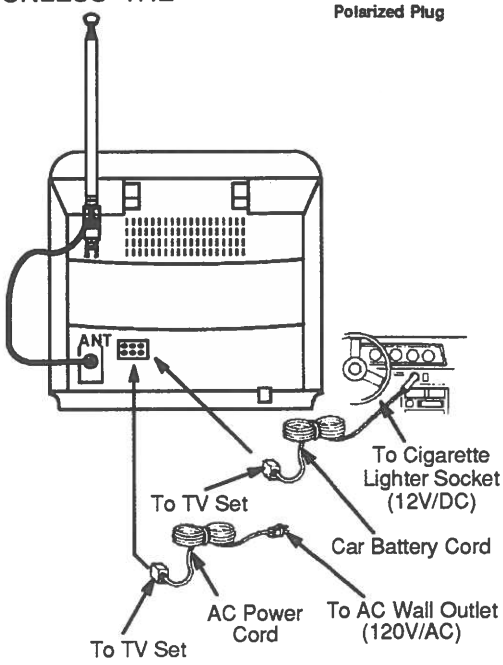
This TV set operates on 120 volt, 60Hz AC and on 12 volt negative ground car battery systems through the cigarette lighter socket. Two power cords (AC Power Cord and Car Battery Cord) are supplied.

A. House Current Operation

Insert the AC power cord (supplied) into the socket on the rear of the TV and connect the plug to a convenient wall outlet (120 volt, 60Hz).

This plug is polarized for safety. If you are unable to insert the plug fully into the outlet try reversing the plug. If the plug should still fail to fit, contact your electrician. Do not defeat the safety purpose of the polarized plug.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.



B. Car Battery Operation

Prior to Use:

Before connecting the car battery cord (supplied), check the polarity of your car battery. The car cord supplied is designed for use with a negative grounded battery. If your car has a positive ground, consult your dealer. If you have any questions concerning the car polarity or battery voltage, consult your car dealer.

Connection and Use:

Remove the cigarette lighter from your car and insert the car battery cord plug in its place. Insert the car cord into the socket on the rear of the TV. To turn Receiver ON, use the POWER button on the Receiver or Remote Control.

Notes:

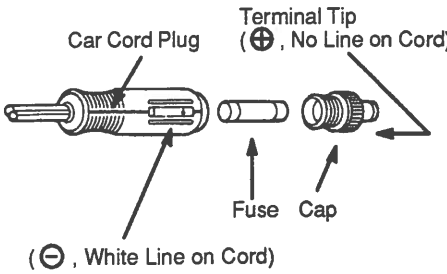
1. While the car is moving, it may be difficult to obtain good reception due to signal variations.
2. It is recommended to operate with the engine idling under the following conditions:
   a) Very low outside temperatures likely to cause difficult engine starts.
   b) Viewing the Receiver for more than just a few hours. (For personal safety when in a vehicle with engine idling always keep a window slightly open to prevent being overcome from possible engine fume leaks).
3. Do not operate the set when starting the engine to avoid overloading the engine.
4. When finished viewing, turn OFF POWER and disconnect power cord from cigarette lighter. Failure to do so may discharge your car battery.

Fuse Replacement

If the car cord does not seem to function normally, check if the fuse in the plug is blown. If the fuse is blown, replace it with the spare fuse supplied.

Proceed as follows:

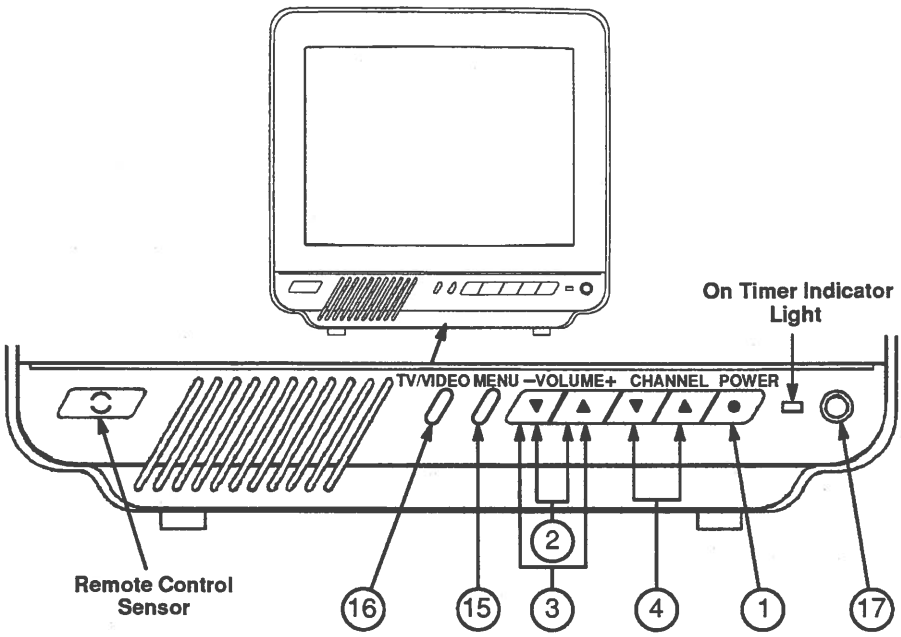
1. Turn the TV set OFF and unplug the car cord from the cigarette lighter socket.
2. Loosen and remove the cap.
3. Pull out the fuse.
4. Install the spare fuse supplied.
5. Replace the cap.
6. Plug the car cord into the cigarette lighter socket. and turn the TV set on.

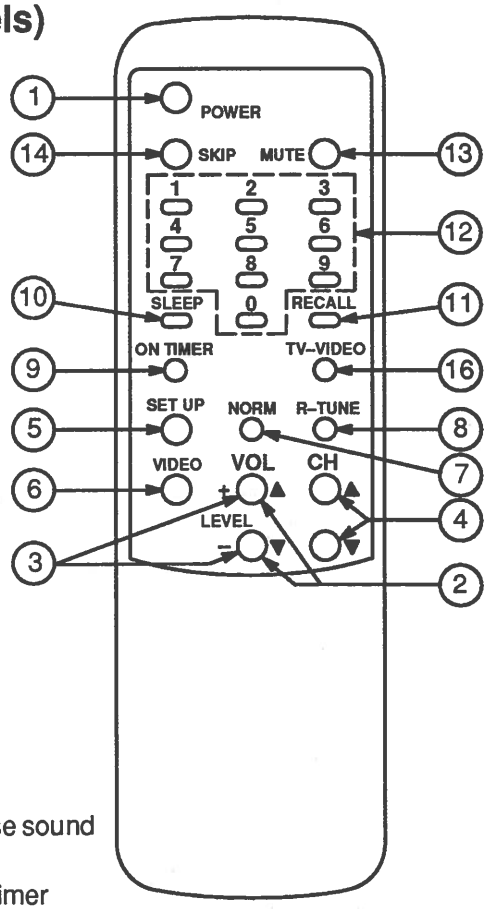


Notes:

1. When the fuse is blown, replace it only with the same type, 7A–125V. Never use an ordinary piece of wire.
2. Always keep the cigarette lighter socket of the car clean. If the socket is dirty with cigarette ash, the resulting bad contact may overheat the car cord plug.

Location of Controls (In Some Models)





Remote Control

Quick Reference Control Operation

(1) **Power Button** – Press to turn ON. Press again to turn OFF.

(2) **Vol (Volume) Buttons** – Press the VOL (VOLUME) ▲ button to increase sound level. Press the VOL (VOLUME) ▼ button to decrease sound level.

(3) **Level (+) and (–) Buttons** – Press to adjust Video, Set Up and On Timer Menus, when displayed.

(4) **Ch (Channel) Buttons** – Press the CH (CHANNEL) ▲ button to select the next higher programmed channel. Press the CH (CHANNEL) ▼ button to select the next lower programmed channel.

(5) **Set Up Button** – Press the SET UP button to display Set Up Menus:
- Initiate Auto Channel Programming
- Program Channel Memory
- Select TV/ANT or Cable Tuning System
- Set Clock

(6) **Video Button** – Press the VIDEO button to display Video Adjustment Menus. Use to adjust Color, Tint, Brightness, Picture, and Sharpness.

(7) **Norm (Normalize) Button** – Press the NORM (NORMALIZE) button while any Video Adjustment Menu is displayed. Adjustments will automatically set to a factory preset level.

(8) **R–Tune (Rapid Tune) Button** – Press to alternately switch between the last two channels selected.

(9) **On Timer Button** – Press to display On Timer Menu. This feature allows the Receiver to turn ON at a predetermined time and channel.

(10) **Sleep Button** – Press the SLEEP button to select automatic turn OFF in 30, 60 or 90 minutes.

(11) **Recall Button** – Press the RECALL button to display:
- Time of Day (if clock is set) or status of Sleep Timer
- Channel number

(12) **Keyboard "0 through 9" Buttons** – Press desired channel number to access any programmed or unprogrammed channel.

(13) **Mute Button** – Press the MUTE button to mute sound. A second press will return sound to its previous level.

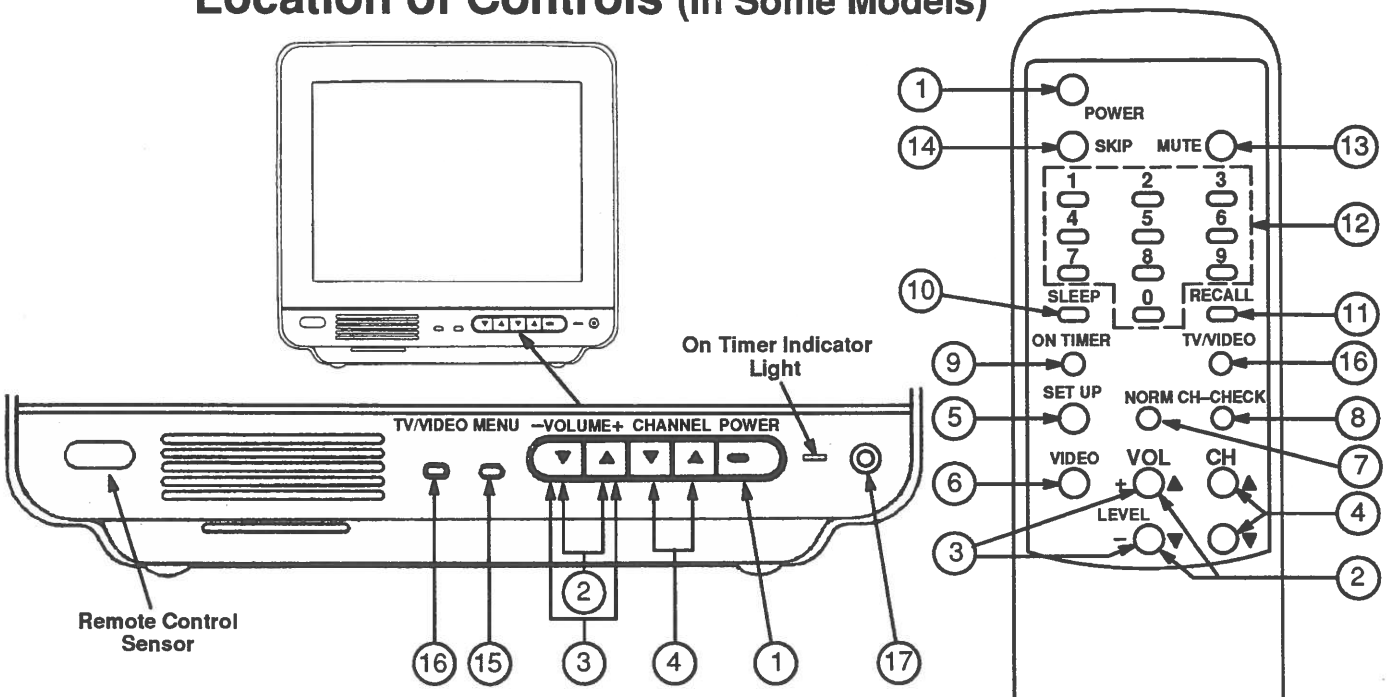
(14) **Skip Button** – Press the SKIP button to choose 30, 60 or 90 seconds, then select any other channel(s). When the time elapses you will automatically return to the original channel.

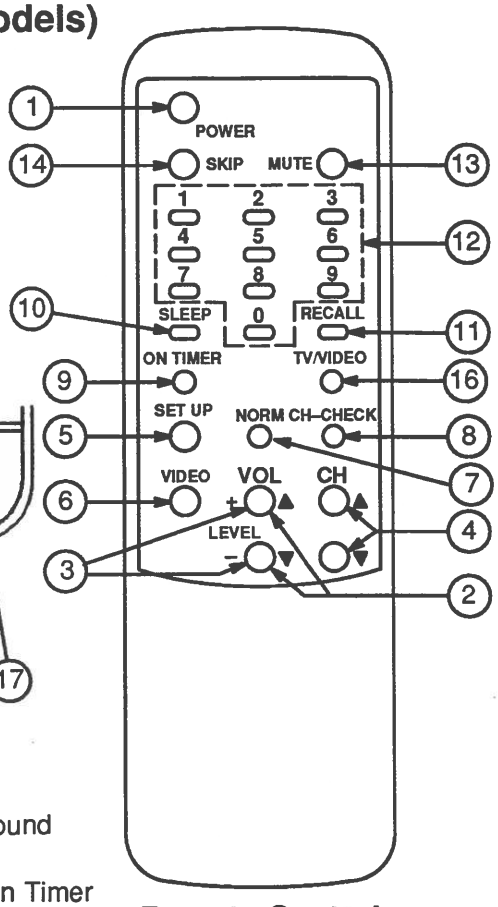
(15) **Menu Button** – Press the MENU button to access both Video and Set Up Menus.

(16) **TV/Video Button** – Press the TV/VIDEO button to select TV or Video Input Mode of operation.

(17) **Earphone Jack** – Plug in an optional earphone for private monitoring of sound.

Location of Controls (In Some Models)





Remote Control

Quick Reference Control Operation

(1) **Power Button** – Press to turn ON. Press again to turn OFF.

(2) **Volume Buttons** – Press the VOLUME (VOL) ▲ button to increase sound level. Press the VOLUME (VOL) ▼ button to decrease sound level.

(3) **Level (+) and (–) Buttons** – Press to adjust Video, Set Up and On Timer Menus, when displayed.

(4) **Channel Buttons** – Press the CHANNEL (CH) ▲ button to select the next higher programmed channel. Press the CHANNEL (CH) ▼ button to select the next lower programmed channel.

(5) **Set Up Button** – Press the SET UP button to display Set Up Menus:
- Initiate Auto Channel Programming
- Program Channel Memory
- Select TV/ANT or Cable Tuning System
- Set Clock

(6) **Video Button** – Press the VIDEO button to display Video Adjustment Menus. Use to adjust Color, Tint, Brightness, Picture, and Sharpness.

(7) **Norm (Normalize) Button** – Press the NORM (NORMALIZE) button while any Video Adjustment Menu is displayed. Adjustments will automatically set to a factory preset level.

(8) **Ch–Check (Channel Check) Button** – Press to alternately switch between the last two channels selected.

(9) **On Timer Button** – Press to display On Timer Menu. This feature allows turn ON at a predetermined time and channel.

(10) **Sleep Button** – Press the SLEEP button to select automatic turn OFF in 30, 60 or 90 minutes.

(11) **Recall Button** – Press the RECALL button to display:
- Time of Day (if clock is set) or status of Sleep Timer
- Channel number

(12) **Channel Keyboard "0 through 9" Buttons** – Press desired channel number to access any programmed or un-programmed channel.

(13) **Mute Button** – Press the MUTE button to mute sound. A second press will return sound to its previous level.

(14) **Skip Button** – Press the SKIP button to choose 30, 60 or 90 seconds, then select any other channel(s). When the time elapses you will automatically return to the original channel.

(15) **Menu Button** – Press the MENU button to access both Video and Set Up Menus.

(16) **TV/Video Button** – Press the TV/VIDEO button to select TV or Video Input Mode of operation.

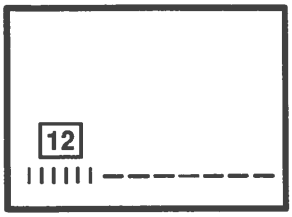
(17) **Earphone Jack** – Plug in an optional earphone for private monitoring of sound.

Control Operation

① Power Button

Press the POWER button to turn ON. Press again to turn OFF. Channel and volume level will be the same as when last turned off. Channel number and time (when clock is set) will be displayed when the Receiver is first turned on.

② Vol (Volume) Buttons



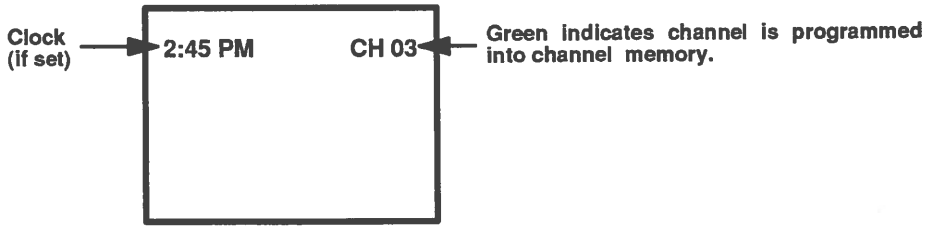
Press the VOL (VOLUME) ▲ button to increase volume or press the VOL (VOLUME) ▼ button to decrease volume. An On–Screen display will indicate volume level.

③ Level (+) and (–) Buttons

The LEVEL buttons are used in conjunction with the Video, Set Up and On Timer Menus. Once a display is On Screen the LEVEL (+) and (–) buttons are used to make the desired adjustment.

④ Ch (Channel) Buttons

Press the CH (CHANNEL) ▲ or ▼ buttons to sequentially select only those channels programmed in memory. Channel number and time (when clock is set) will display for each channel selected.

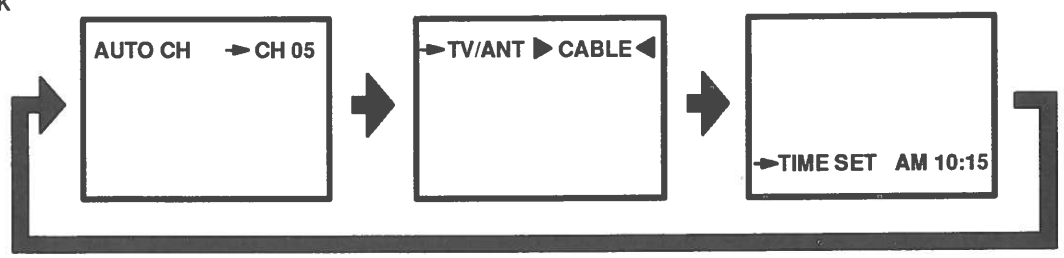


- The TV/VIDEO button must be set to the TV position.
- The TV/ANT–CABLE Menu must be set for the type of signal at the antenna input. Select TV/ANT for off air signals or CABLE for cable signals.
- All channels will be available when there are no channels programmed in memory (indicated by Yellow channel numbers).
- Only programmed channels will be selected when two or more channels are programmed in memory (indicated by Green channel numbers).
- Non–programmed channels can be selected anytime with the Remote Control Keyboard "0"–"9" buttons.

⑤ Set Up Button

The SET UP button is used to display a number of On Screen Set Up Menus that allow the viewer to select the following features:

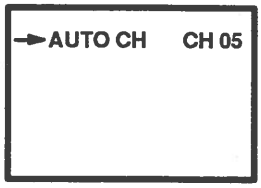
- Auto Channel Programming
- Program Channel Memory
- Select TV/ANT or Cable Tuning System
- Set Clock



NOTE: Prolonged power interruption will result in the loss of Set Up feature adjustments.

Auto Channel Programming

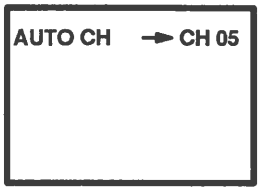
This feature automatically scans through all TV channels. It will add to channel memory any channel with a signal present. The channel numbers will be displayed in Green. Make sure TV/ANT–CABLE Menu is set properly for the TV signal system you have.



1. Press the SET UP button. A Set Up Menu will display On Screen.
2. Press the SET UP button repeatedly until the arrow points to AUTO CH.
3. Press the LEVEL (+) button. Auto channel programming feature starts. To defeat once started, press ANY OTHER button and the feature stops with all previously added channels programmed into channel memory.

Add/Erase Channels From Memory

- Make sure TV/ANT–CABLE Menu is set properly for the TV signal system you have.
- Channels added to memory will be tuned when using CHANNEL ▲ or CHANNEL ▼ button.
- Channels erased from memory will be skipped when using CHANNEL ▲ or CHANNEL ▼ buttons.

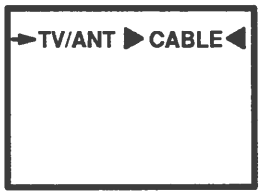


1. Press the SET UP button. A SET UP Menu will display On Screen.
2. Press the SET UP button repeatedly until the arrow points at channel number display.
3. Select a preferred channel while the menu is On Screen. Use CHANNEL▼/▲ button or use Keyboard "0 through 9" buttons.

   NOTE: A channel displayed in Yellow indicates the channel is not programmed into channel memory. A channel displayed in Green indicates the channel is programmed into channel memory.
4. Press the LEVEL (+) button to ADD a channel when channel number is displayed in Yellow.
5. Press the LEVEL (–) button to ERASE a channel when channel number is displayed in Green.

TV/ANT–Cable Tuning

This feature allows the viewer to choose the proper tuning system for the type of signal at the antenna input.



1. Press the SET UP button repeatedly until the TV/ANT–CABLE Menu appears.
2. Press the LEVEL (+) or (–) button to activate the proper tuning system. The selected tuning system will appear in Red.

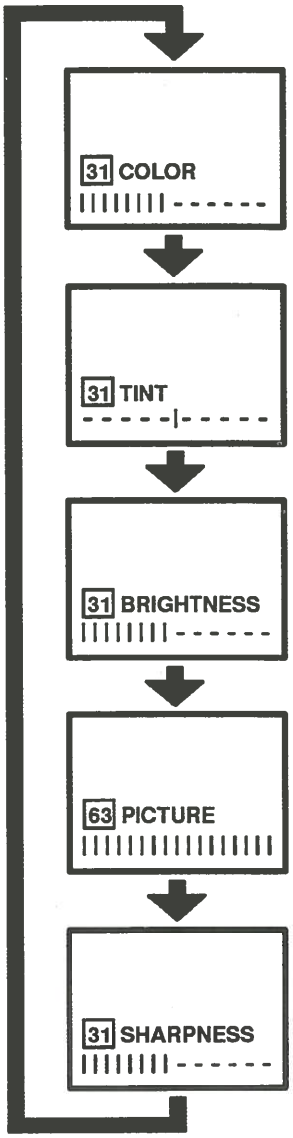
- TV/ANT is used when not connected to a Cable TV System, for example, when using a VHF/UHF antenna (Channels 02–69).
- CABLE is used when connected to a Cable TV System and you are not using a cable company converter box (Channels 01–99).
- Some Cable TV Systems encode (scramble) program material on specific channels. A cable company supplied decoder is required to reproduce an acceptable picture.
- Certain Cable TV Systems severely offset some channels to reduce interference. It will be necessary to use the cable company supplied converter to receive these specific channels.
- This Receiver automatically selects the correct CATV mode (STD–HRC–IRC) for the type of cable system in use. This feature operates each time channel change occurs. Changing signal sources at the antenna input terminals without changing channels may cause the unit to tune off channel. Re–accessing the desired channel will allow the tuner to select the correct frequency and lock on channel.

Setting Clock Time

1. Press the SET UP button repeatedly until TIME SET Menu appears and CLOCK HOURS position is in Red.
2. Press the LEVEL (+) button to advance hours. Press the LEVEL (–) button to reverse hours. Set AM or PM hours accordingly.
3. Press the SET UP button again. CLOCK MINUTES position is in Red. Press the LEVEL (+) button to advance minutes. Press the LEVEL (–) button to reverse minutes.

⑥ Video Button

- COLOR – adjust for desired color intensity.
- TINT – adjust for natural flesh tones.
- BRIGHTNESS – adjust so that dark areas of picture just become black for a crisp detail.
- PICTURE – adjust whitest parts of picture to your preference.
- SHARPNESS – adjust for best clarity of outline detail and/or to reduce effects of noise interference in picture.



To Adjust

1. Press the VIDEO button to display a Video Adjustment Menu.
2. Each additional press of the VIDEO button will select a different video function.
3. Press or Hold the LEVEL (+) or (–) button to adjust function. Adjustment scale and setting indicator number will display On Screen. Use to establish a desired level.

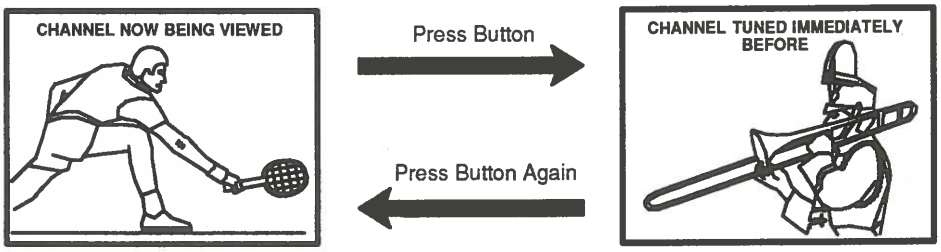
NOTE: Press – adjustment is made in small increments with each press.
Hold – adjustment is continuous until button is released.

4. Adjust each function to your own preference or you may select a factory preset level by pressing the NORM (NORMALIZE) button while any of the Video Adjustment Menus are displayed.

⑦ Norm (Normalize) Button

Press the NORM (NORMALIZE) button while any Video Adjustment Menu is displayed. Adjustments will automatically set to a factory preset level.

⑧ R–Tune (Rapid Tune) or Ch–Check (Channel Check) Button



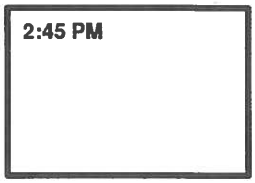
This feature allows the viewer to switch between the current channel and the last channel viewed. The switching is instantaneous without passing through any intermediate channels and no On Screen displays are activated.

- This feature will not operate if the same channel number is entered twice in succession.

⑨ On Timer Button

Press the ON TIMER button to view status of the On Timer Menu. This menu may be programmed for any desired turn on time and channel within a 24 hour period.

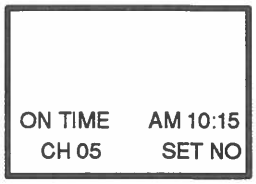
IMPORTANT NOTE: CLOCK MUST FIRST BE SET BEFORE THIS FEATURE CAN BE USED. Clock setting can be confirmed when the time display appears on screen during initial turn on or channel change.



To Program On Timer Menu:

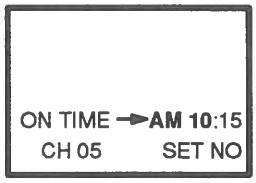
1. Press the ON TIMER button to display On Timer Menu.

1.



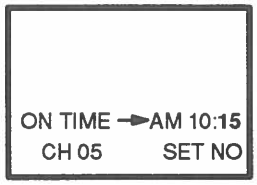
2. Press the ON TIMER button repeatedly to advance cursor (→) to ON TIME hours position and it will display in Red. Use LEVEL (+) or (–) button to set hours AM or PM.

2.



3. Press the ON TIMER button to advance to MINUTES position and it will display in Red. Set minutes with the use of LEVEL (+) or (–) button.

3.

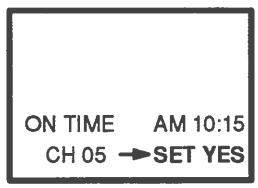


4. Press the ON TIMER button to advance cursor to CH position and it will display in Red. Press LEVEL (+) or (–) button until the desired channel number is displayed. (Only channels programmed into Channel Memory are available.)

4.

5. Press the ON TIMER button to advance cursor to SET position. Each press of LEVEL (+) or (–) button selects YES or NO. Select YES if you want to activate the ON TIMER feature (On Timer indicator will light). Select NO if you do not want to activate the ON TIMER feature.

5.



Special Conditions Affecting On Timer

- The ON TIMER feature must be reset each time it is desired.
- After initial turn ON by the ON TIMER feature, turn OFF will automatically occur in 90 minutes unless any button is pressed.
- Turn ON prior to ON TIMER feature activation will cause the channel designated by the On Timer Menu to be tuned at the programmed time.

⑩ Sleep Button

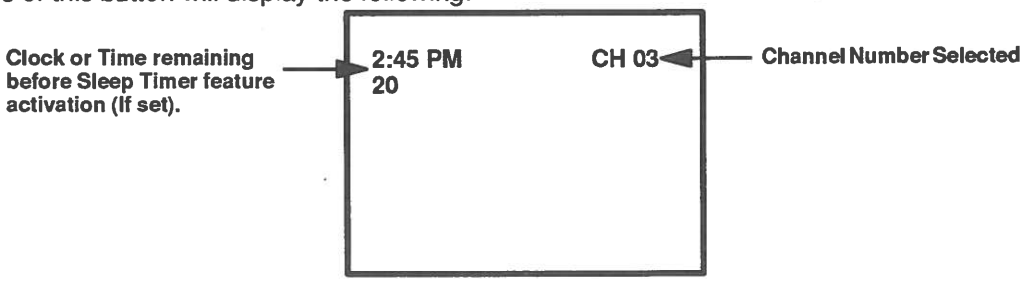
This feature automatically shuts off power after a predetermined time lapse of 30, 60 or 90 minutes.

1. Press the SLEEP button once to set the Sleep Timer for 30 minutes as displayed On Screen.
2. Press the SLEEP button twice to set the Sleep Timer for 60 minutes as displayed On Screen.
3. Press the SLEEP button three times to set the Sleep Timer for 90 minutes as displayed On Screen.
4. Press the SLEEP button continuously until the display reads 0 to deactivate the Sleep Timer.

- Display will flash 3, 2 and 1 to indicate the last three remaining minutes prior to turn off. This allows the viewer to reset or deactivate this function before shut off.
- After Sleep Timer is set, use the RECALL button to find out the time that remains prior to automatic turn off. A press of the SLEEP button while Sleep Timer function is active will reset the timer clock to the next higher 30 minute interval.

⑪ Recall Button

A press of this button will display the following:



⑫ Channel Keyboard "0 through 9" Buttons

Press two keys to access any programmed or unprogrammed channel. Example: "0" and "5" for channel 5.

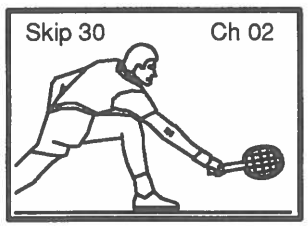
- Audio will mute when a channel with weak or no signal is selected.
- Second number must be pressed within 2 seconds of the first entry or channel will change to that of the first number entered.
- The current channel will remain on when an invalid channel number is entered. (Example: Channel 70 while in the TV/ANT mode).
- The RECALL button may be used at anytime to display the current channel.

⑬ Mute Button

Press the MUTE button to mute sound immediately. "MUTE" will display for a few seconds. Press again and sound will be restored to same level as before muting. Display of volume level adjustment will appear.

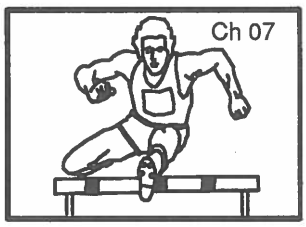
⑭ Skip Button

This feature allows the viewer to temporarily select other channels and automatically returns to the original channel after a predetermined time period.

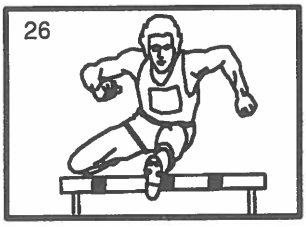


1. Press SKIP button.

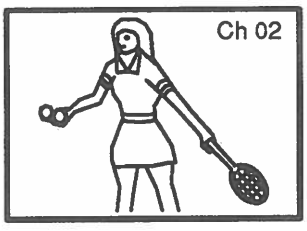
Once for 30 seconds.
Twice for 60 seconds.
Three times for 90 seconds.
Four times to deactivate feature.



2. Select any other channel or channels.



3. Channel number disappears, then Skip Timer will appear and count down.



4. Automatically returns to original channel when time elapses.

⑮ Menu Button

The MENU button will allow the viewer to access all Video and Set Up Menus.

Press the MENU button repeatedly to display:

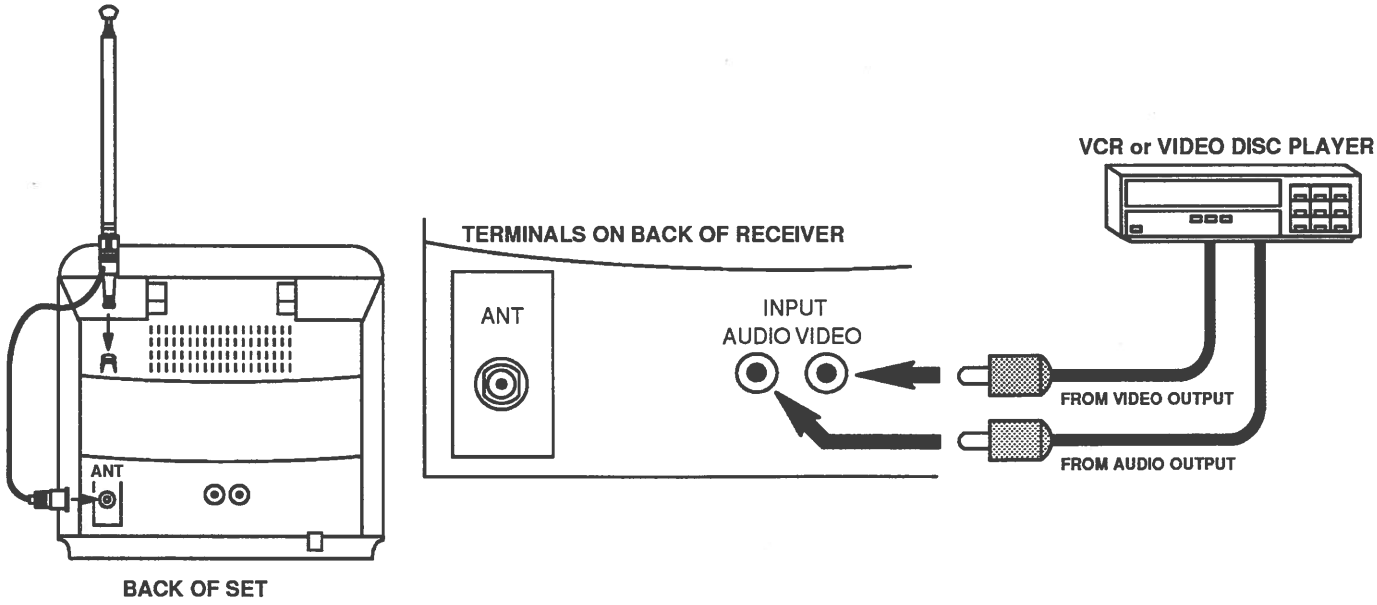
The Video Menus	The Set Up Menus
• Color	• Auto Channel Programming
• Tint	• Program Channel Memory
• Brightness	• TV/ANT–Cable Selection Menu
• Picture	• Set Clock
• Sharpness	

Use the LEVEL (+) and (–) buttons to adjust or activate features as desired.

⑯ TV/Video Button

Each press of the TV/VIDEO button, alternately switches between TV and Video Modes. (Equipment connected to input jacks).

- TV position – normal TV operation (CH and channel number displays On Screen).
- VIDEO position – used when optional accessory video equipment (such as VCR, VIDEO DISC player, etc.) is connected to the INPUT JACKS on back of set (VIDEO will display On Screen).



⑰ Earphone Jack

Located on the front control panel is an Earphone Jack for use with an optional earphone. Insertion of the earphone plug automatically cuts–off the TV speaker for personal listening. This jack accepts an earphone with an 1/8" mini plug.

Disassembly For Service

Back Cover

1. Remove all 5 screws on back of set and slowly remove back.

A–Board – Main Chassis

1. Place set on side (soft clean surface) and slide chassis completely out.
   NOTE: Some tie–wraps securing wire dressings may have to be unfastened for chassis removal.

P–Board – DC Power Supply

P–Board is fully accessible without removal.

1. If removal is necessary, 2 screws secure the board to the cabinet's side.

C–Board – CRT Output

1. Plugs into socket on CRT neck.

H–Board – A/V Jacks

1. Affixed to A–Board by a plastic stand–off.

R–Board – Remote Receiver

1. Secured to cabinet by 1 screw.

L–Board – LED Indicator/Earphone Jack

1. Secured to cabinet front by 1 screw.

X–Board – A/V Switch

1. Affixed to A–Board by solder connections at A4

Y–Board – Sub Tint

1. Affixed to A–Board by solder connections A1 and A2.

Disassembly for CRT Replacement

1. Discharge CRT as instructed in Safety Precautions.
2. Disconnect yoke plug, degaussing coil plug, speaker plug (SP), Remote Receiver (A8), and L–Board (A32), from main board and CRT 2nd anode button. Also remove DC power supply plugs P1, P2, P3, A68, A69 & A70 when applicable.
3. Remove C–Board from CRT base and unplug black wire (CRT dag ground) from board.
4. Slide main chassis assembly completely out. Remove with CRT Board.

CRT Replacement

1. Perform DISASSEMBLY FOR CRT REPLACEMENT procedure.
2. Insure CRT H.V. anode button is discharged before handling CRT. See SAFETY PRECAUTIONS on handling the picture tube.
3. Remove components on CRT neck and place cabinet face down on a soft pad.
4. Remove CRT mounting screws from each corner and remove CRT with dag ground braid attached.
5. Note original mounting of dag ground assembly to insure proper re–installation on the replacement CRT.
6. Remove dag ground braid from CRT.
7. Mount dag ground braid on replacement CRT. Mount replacement CRT in cabinet.

Service Notes

IMPORTANT: To protect against possible damage to solid state devices due to arcing or static discharge, make certain all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing to avoid damage to test equipment or chassis. Connect test equipment to correct ground (⏚) or (⏚) when servicing or incorrect readings will occur.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X–radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X–radiation and shock and fire hazard, the parts shown in the "BOXED" areas of the schematic must be replaced with identical replacement parts. Order parts from the manufacturer's parts center using numbers shown in this service manual or give complete chassis number and part reference number.

For optimum performance and reliability, all other parts should be replaced with components having identical specifications.

Horiz Osc Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage. If for any reason the high voltage exceeds a predetermined amount, this circuit operates and detunes the horizontal oscillator. This limits high voltage.

The over–voltage protection circuit is not adjustable. However, if components in the "BOXED" areas of the schematic in either the horizontal sweep system or the over–voltage protection circuit itself are changed the operation of the circuit should be checked using the following procedure.

Equipment needed to check disable circuit:

1. Accurate voltmeter (0 – 200V scale)
2. High Voltage Meter (0 – 40kV)
3. Variac and Isolation Transformer
4. Jumper wire

Procedure

1. Tune in a station to verify horizontal is in sync.
2. Obtain Monoscope pattern.
3. Connect voltmeter (+) to TPD1 and (–) to TPD2. Normalize VIDEO control menu. Adjust BRIGHTNESS to (0) and PICTURE for 0.9 volt reading on voltmeter.
4. Turn Receiver OFF. Connect jumper from TP91 to TP94.
5. Reduce AC supply voltage to approx. 90V. Connect high voltage meter to CRT 2nd anode (H.V. button). **NOTE:** Use dag ground for minus (–) lead connection of meter.
6. Turn Receiver ON. Slowly raise AC supply voltage and confirm that high voltage does not exceed 29kV when horizontal just begins to pull out of sync and sound mutes. If high voltage is not within the specified limit, the cause must be determined before the Receiver is returned to the customer. (SEE NEW CIRCUIT SECTION).

Power Supply Adjustment Procedure

AC Test Preparation

1. Plug AC cord in power supply socket in rear of set.
2. Plug AC cord into 120 V 60Hz source (using isolation transformer).
3. Turn main POWER switch ON.

130.8V B+ Voltage Confirmation

Automatic regulation by IC801. There is no B+ adjustment control.

1. Set BRIGHT, PICTURE and COLOR controls of Video Menu to Minimum (0).
2. Connect a DVM between TP91 and TP92 (line operated ground).
3. Confirm that B+ voltage is 130.8V ±1V.

Source Voltage Chart

Measure voltage test points using line isolated ground for minus lead of DVM.

TPD7	+12V ±1V
TPD8	+26V ±2V
TPD9	+19V ±2V
TPD12	+19V ±2V
Plug A17 (Pin 1)	+175V ±15V

DC Test Preparation

1. Disconnect AC cord from power supply socket in rear of set and connect DC car cord.
2. Connect 12V DC/7 Amp (minimum) power supply to DC cord plug adapter as shown.
3. Turn on DC power supply. Adjust to 12V.
4. Turn Receiver ON.
5. P–Board now ready for Test/Adjustment.

12V DC P–Board Source Voltage Chart

TPP2	12V
TPP1	130.8V

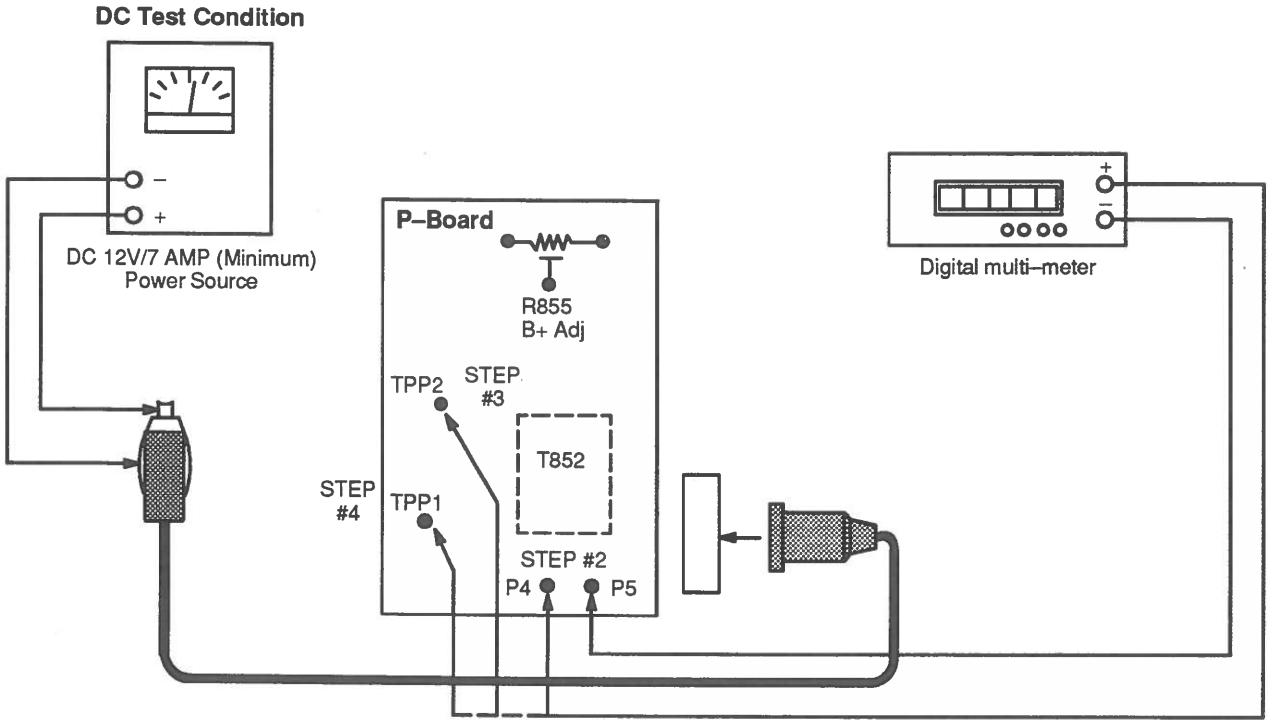
130.8V Alignment (P–Board)

Preparation

1. Operate the Receiver for 20 minutes.
2. Connect a digital multi–meter (+) to P4 and (–) to P5. Confirm +12V DC.
3. Connect a digital meter (+) to TPP2 and confirm 11.65V ±0.1V.
4. Connect the digital multi–meter (+) to TPP1.

Alignment Procedure

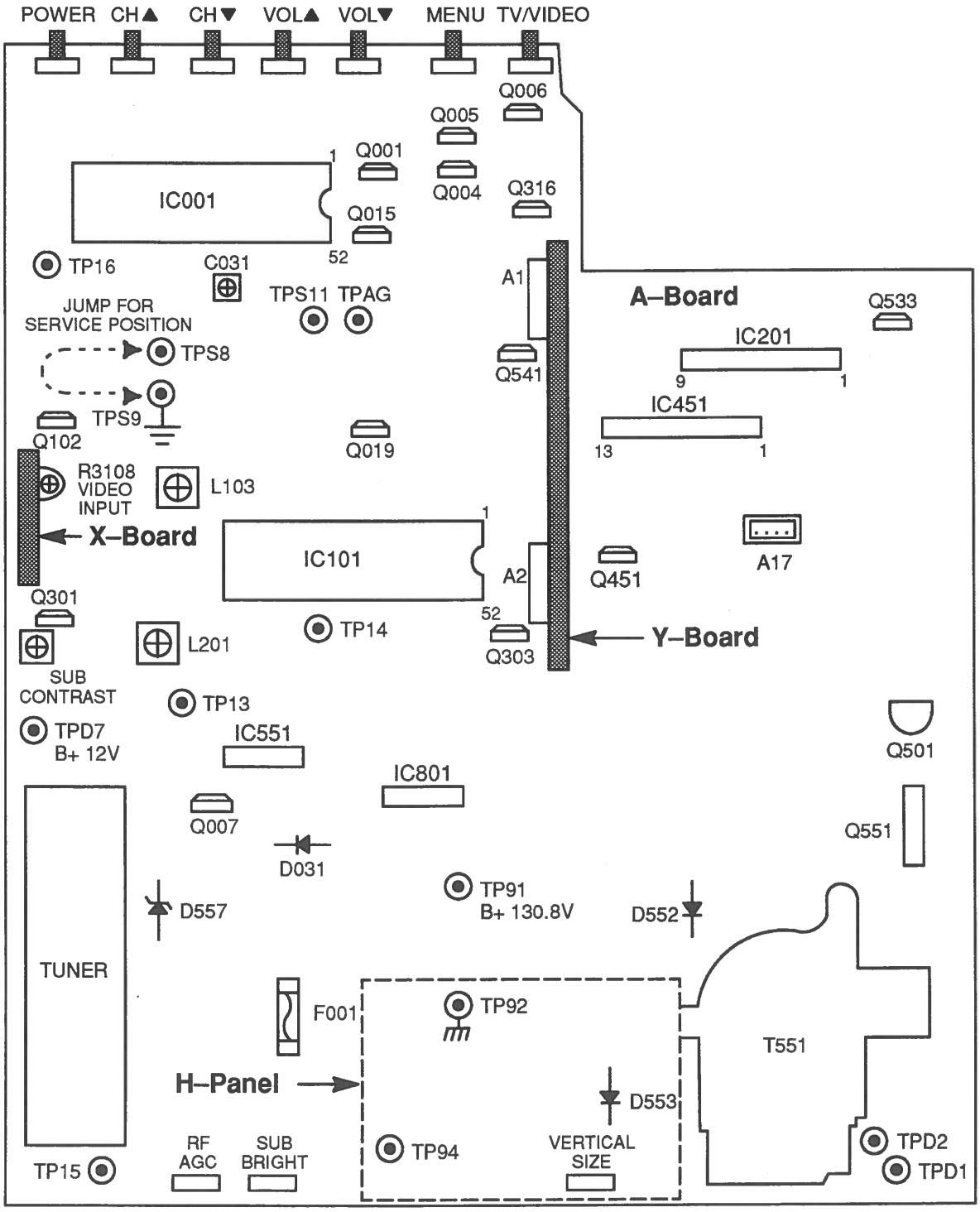
1. Tune in a black and white signal under normal reception conditions.
2. Set BRIGHT and PICTURE controls of Video Menu to Minimum (0).
3. Adjust R855 (B+ adj.) to set the output voltage to 130.8V ±1V at TPP1.
4. Vary 12V power supply from 10V to 16V. Confirm that B+ remains less than 133 volts DC and current is less than 6 amps at 12V DC power.
5. Return Video menu to Normal.



Service Adjustment Procedures

ALL SERVICE CONTROLS ARE FACTORY PRESET AND SHOULD NOT REQUIRE ADJUSTMENT UNLESS CONTROL AND/OR ASSOCIATED COMPONENTS ARE REPLACED.
NOTE: CONNECT MINUS LEAD OF VOLTMETER TO CORRECT GROUND FOR CIRCUIT BEING CHECKED. WHEN NECESSARY TO USE A LINE OPERATED GROUND, THE GROUND INDICATION (⏚) WILL BE INDICATED. FOR THIS GROUND, USE TP92. FOR ALL OTHER CIRCUITS, CONNECT MINUS LEAD OF VOLTMETER TO LINE ISOLATED GROUND (⏚) IC451 HEAT SINK OR CHASSIS GROUND.

Main Board Service Test Points



Top View

130.8V B+ Voltage Confirmation

1. Set BRIGHT, PICTURE and COLOR of Video Menu to Minimum.
2. Connect a DVM between TP91 and ground (⏚) TP92.
3. Confirm that B+ voltage is 130.8V ±1V. This voltage supplies B+ to Horizontal & Flyback circuits.

Source Voltage Chart

120V AC line input. BRIGHT and PICTURE of Video Menu to Minimum. Use isolated ground (⏚) for minus lead of DVM. These voltages are supplied by flyback transformer T551.

TPD7	+12.0V ±1V
TPD9 (No test pin)	+19V ±2V (IC551 pin 1)
TPD8 (No test pin)	+26.0V±2V (D552 cathode)
TPD12 (No test pin)	+19V ±2V (D553 cathode)
Plug A17 (Pin 1)	+175V ±15V

+5V Source Voltage

Cathode D557 (Tuner BP)
Emitter Q004 (MPU, VDD ports– IC001 Function buttons)
Emitter Q005 (Remote Receiver)

+10V Standby B+

Cathode D031 (On–Off relay, Timer L.E.D., IC101 Pin 9–Horiz Osc, Q004 – +5V regulator).

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Confirm B+ 130.8V is within limit.
3. Using a calibrated high voltage meter confirm that High Voltage is 22.5kV (±1.25kV).

RF AGC Delay R106

Adjust only if overloading on strong signal or busy background (snow) is present on moderate strength signals.

1. Adjust RF AGC control R106 until snow appears in picture, then adjust control until snow is eliminated.
2. Check all channels for optimum setting.

AFC Field Adjustment L103

1. Select TV/ANT mode.
2. Defeat AFC by applying jumper from TPS11 to ground (⏚).
3. Connect a digital voltmeter to AFC test point TP16. (Connect [–] lead to ground).
4. Check all active High Band channels 7~13 for AFC voltage range. Select channel with AFC voltage in approximate center of voltage range.
5. Adjust L103 for 4.5V (±0.5V) at TP16.
6. Remove jumper in Step 2. Check all active channels for proper AFC correction. Touch up L103 if required.

NOTE: Do not use CABLE channel with offset carriers for adjustment or in determination of low and high range of AFC voltage.

Sound Alignment L201

1. Select active TV channel.
2. Attenuate signal (loosely couple antenna lead or use RF attenuator pad) for noisy sound.
   - Adjust L201 for Maximum sound. Signal to noise ratio is best when L201 is peaked.
3. Connect antenna or remove RF attenuator for strong signal.

Sub–Brightness Control R318

Adjustment of this control is important for getting proper operation of brightness and picture controls. This adjustment must be made after Sub–Contrast or Color Temperature adjustments are made. **Do not adjust** SCREEN control after Sub–Brightness is set.

Preparation

Connect a color bar signal with 100 IRE white and 7.5 IRE black. Operate television for a minimum of 10 minutes prior to the adjustment.

Procedure

1. Normalize the Video Menu controls.
2. Adjust COLOR to Minimum.
3. Increase SUB–BRIGHTNESS control R318 so black bar starts to look grey. Then decrease SUB–BRIGHTNESS to the point where grey turns to black.
4. Adjust COLOR for normal viewing and check all active channels for good brightness level.

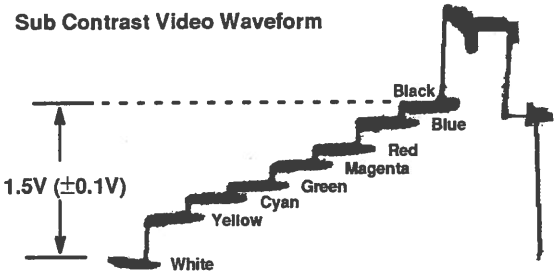
Sub Contrast R304

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or the CRT is replaced.

Preparation

- Obtain a pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black. **NOTE:** The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to your pattern used.

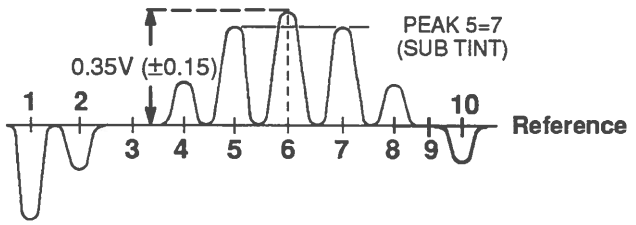
1. Connect signal (pattern as described above).
2. Connect oscilloscope to TP13. Set scope horizontal time base to 20µs (horizontal).
3. Connect a 4.7K ohm jumper from TPD7 to TPD1.
4. Set Video Menu controls to be Normalized.



5. Adjust SUB–CONTRAST control R304 for 1.5V (±0.1V) from white level to black level on video waveform (see video waveform detail).
6. Remove jumper (Step 3).

Color Adjustment R619

1. Apply rainbow color bar signal.
2. Set customer controls
   - Normalize Video Menu. Adjust BRIGHTNESS to Minimum (0). Adjust PICTURE until raster just appears dark.
   - Connect 4.7K resistor jumper between TPD7 (+12V) and TPD1.
3. Connect Oscilloscope to TP48B (C–Board).
4. Adjust SUB TINT R619 (Y–Board) so peak of color bar 6 is 0.35V (±0.15) above reference and peaks of color bars 5 and 7 are of the same magnitude as shown in detail.



Color Temperature Adjustment (B/W Tracking)

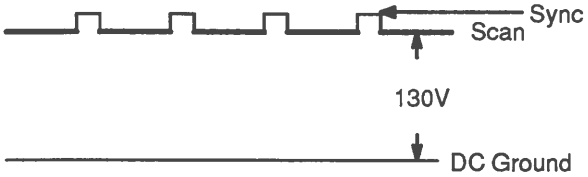
Minor Touch–Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good grey scale and warm highlights".

- LOW LIGHT areas – adjust LOW LIGHT controls (R354 and R355) for grey.
- HIGH LIGHT areas – adjust DRIVE controls (R357 and R358) for warm whites.

Complete Adjustment

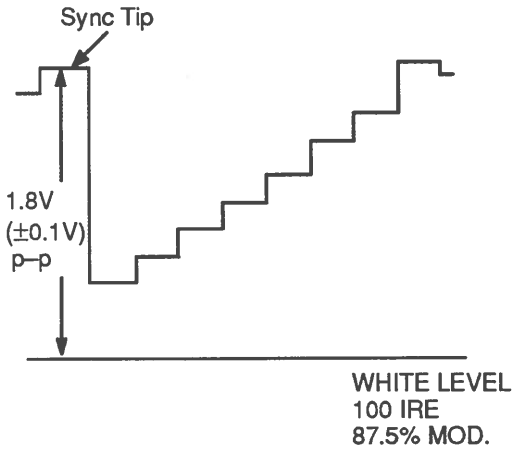
1. Turn Receiver ON and allow 10 minutes warm up at high brightness.
2. Select active TV channel, B/W program if available.
3. Normalize the Video Menu controls.
4. Adjust COLOR to Minimum.
5. Adjust LOW LIGHTS (R354, R355) to Minimum.
6. Adjust HIGH LIGHTS (R357, R358) to Mid point.
7. Collapse vert to a horizontal line by applying jumper between TPS8 and ground (⏚) TPS9 and turn SCREEN control to Minimum (counterclockwise).
8. Connect scope to Green cathode (KG) and adjust SUB BRIGHT (R318) until voltage during scanning period is 130V DC as shown.



9. Increase SCREEN control (Clockwise) until a green horizontal line just appears.
10. With the two LOW LIGHT controls, adjust each to create a white horizontal line.
11. Remove jumper in Step 6.
12. Adjust BRIGHTNESS and PICTURE to Maximum and adjust highlights control (R357 and R358) controls for warm white.
13. Adjust BRIGHTNESS and PICTURE to low level brightness and recheck for low level grey scale. Adjust LOW LIGHTS if necessary.
14. Perform SUB–BRIGHTNESS adjustment.

External Video Adjustment R3108 (X–Board)

1. Apply a pattern with 100 IRE and 87.5% modulation white.
2. Connect oscilloscope to connector A4 Pin 6. Confirm that peak to peak level from sync tip to white level is 1.8V (±0.1V) p–p.
3. Input same pattern (Step 1) to video input and select Video Mode with the TV/VIDEO button.
4. Adjust video input adjustment R3108 for same peak to peak as (Step 2).



Vertical Size R453

1. Turn the VERTICAL SIZE control R453 CCW until top and bottom edges of raster are visible.
2. Adjust the VERTICAL SIZE control CW until raster is approximately 10% overscan. Linearity adjustment is automatic with size adjustment.

Focus (Part of T551)

Adjust the FOCUS control to obtain the sharpest and clearest picture.

MPU Reference Oscillator C031

1. Connect frequency counter from TPS1 (IC001, pin 5) to ground (⏚).

NOTE: Frequency counter probe capacitance should be 8PF or less.

2. Select TV/ANT signal mode with the MENU button. Short TPS2 (IC001, Pin 7) to ground.
3. Select channel 13 and adjust trimmer capacitor C031 for 500KHz (±3.5Hz.)

Purity and Convergence Procedure

Adjustment should be necessary only if the CRT or deflection yoke is replaced or if someone has disturbed the setting. The complete procedure consists of:

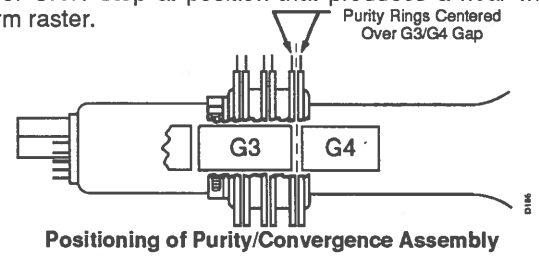
1. Initial static convergence
2. Setting purity
3. Final static convergence

When CRT or Yoke is Replaced

Place the yoke on the CRT neck (do not tighten clamp).

Position purity/convergence assembly as shown and tighten clamp snugly. Cut wax seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss CRT.

Turn Receiver ON and slide deflection yoke back and forth on neck of CRT. Stop at position that produces a near white, uniform raster.



Positioning of Purity/Convergence Assembly

Initial Center Static Convergence

Connect dot/crosshatch generator to Receiver and tune in signal. Observe misconvergence at center of screen only.

Adjust 4 pole magnet (center rings): separate tabs and rotate device to converge blue with red.

Adjust 6 pole magnet (rear rings): separate tabs and rotate device to converge blue and red (magenta) with green. NOTE: Precise convergence at this point is not important.

Purity Adjustment

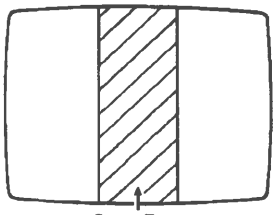
Operate the Receiver for 60 minutes with BRIGHT control at maximum to stabilize the CRT.

Degauss the Receiver fully by using an external degaussing coil.

Short TP14 to ground for blank raster. Set VIDEO MENU BRIGHT to mid position.

Turn red and blue LOW LIGHT controls fully counterclockwise to obtain a green field. Adjust DRIVE controls if green field is not obtained. Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the purity magnet to set the vertical green raster precisely at the center of the screen. (Shown below.)



Green Raster

Slowly move the deflection yoke forward and adjust for the best overall green screen.

Tighten the deflection yoke clamp screw.

Produce a blue and then red raster by adjusting LOW LIGHT controls and observe that good purity is obtained on each respective field.

Observe that uniform white raster is obtained by adjusting LOW LIGHT controls. If screen is not uniformly white, repeat above procedure.

Final Convergence Procedure

NOTE: Before attempting convergence adjustment, vertical size and focus adjustments must be completed. Connect a dot pattern generator to the set. The brightness level should be no higher than necessary to obtain a clear pattern.

Converge the red and blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

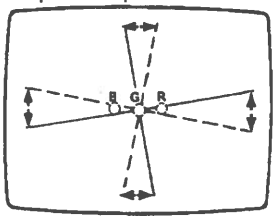
Align the converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering pencil to reseal magnets.

Slightly tilt (do not rotate) the deflection yoke vertically and horizontally to obtain good overall convergence.

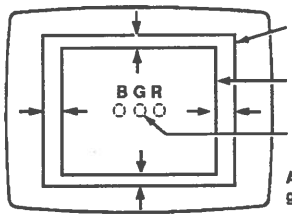
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure deflection yoke by inserting side two wedges at 3 and 7 o'clock positions.

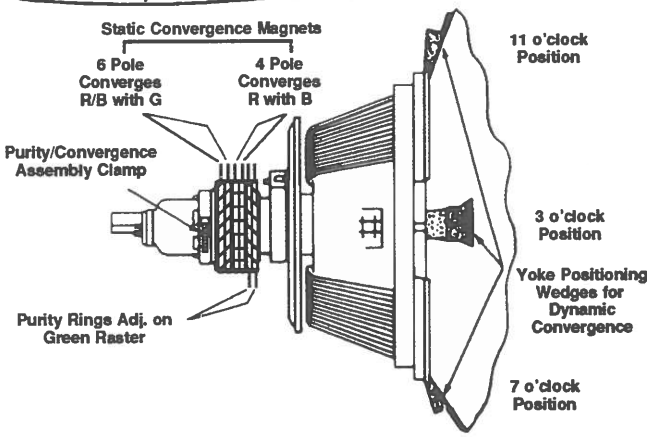
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over tab to secure CRT.



As the yoke is moved vertically, the rasters produced by the outside guns rotate in opposite directions.


B G R
Raster produced from one of the outside electron beams
Raster from the other outside electron beam
Static convergence magnets are set for center convergence

As the yoke is moved horizontally, one raster gets larger while the other gets smaller


Static Convergence Magnets
6 Pole Converges R/B with G
4 Pole Converges R with B
Purity/Convergence Assembly Clamp
Purity Rings Adj. on Green Raster
11 o'clock Position
3 o'clock Position
7 o'clock Position
Yoke Positioning Wedges for Dynamic Convergence

Permalloy Convergence Corrector Strip (Part No. OFMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.

New Circuits

Horizontal Disable Circuit (X–Ray Protection)

This circuit protects against excessive high voltage. If for any reason high voltage exceeds a predetermined level, the circuit operates to shift horizontal frequency and limit high voltage.

Horizontal pulses from pin 6 of flyback transformer T551 are rectified by diode D531. The resultant positive DC voltage at the cathode of D531 is directly proportional to high voltage variations. This voltage is filtered and applied to the cathode of Zener diode D533 via R532/R533 precision resistive divider.

If high voltage should increase, the horizontal pulse amplitude at pin 6 of flyback T551 increases, so the positive voltage at the cathode of D531 also increases. At a specified high voltage level, the created positive voltage exceeds the Zener diode's break down voltage and it conducts to apply positive voltage to the base of Q533. R534 is added to ensure that Q533 is not activated by any circuit noise during normal operation when the Zener diode D533 is not conducting.

Q533 acts as a resistance in parallel with the Horizontal AFC Filter circuit R502/C506/C507. As it conducts, its resistance lowers and thus dampens the Horizontal AFC Filter circuit. This produces an increase in the horizontal oscillator frequency and lowers the high voltage.

Servicing Procedure

If the horizontal is off frequency, the cause must be determined to be either the disable circuit or horizontal circuit. Also, if the disable circuit does not operate during the "Horizontal Disable Test" specified in this manual, the fault must be corrected in order to insure that high voltage does not exceed safe operation parameters.

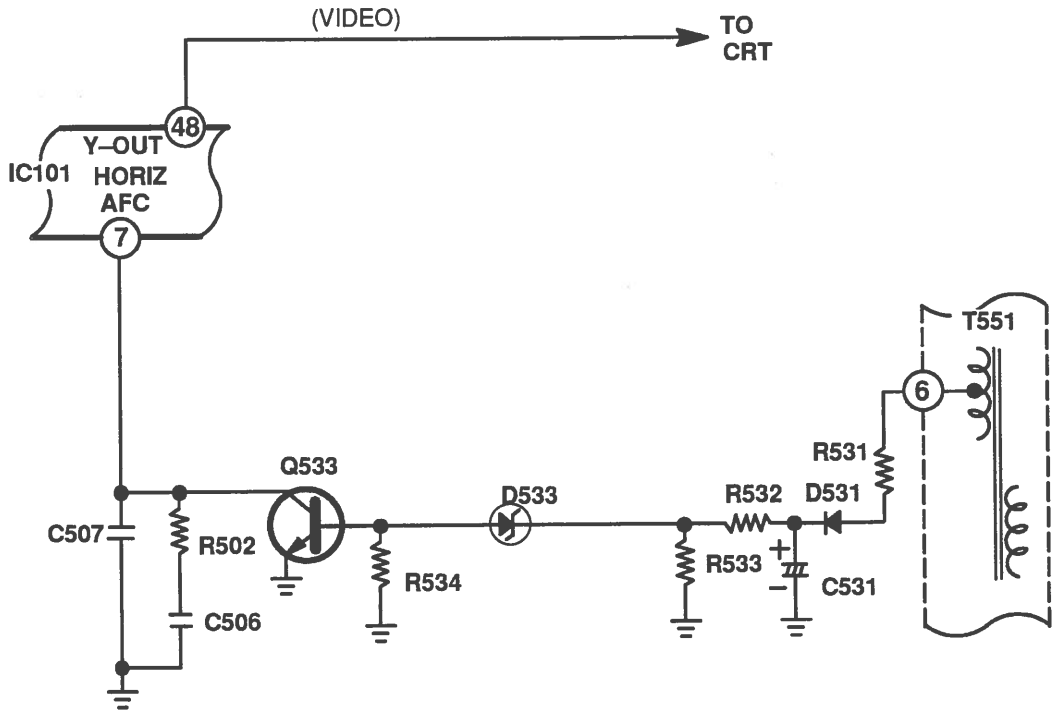
SYMPTOM – No Change in Frequency When "Horizontal Disable Test" is Performed.

NOTE: B+ (TP91) should increase between 153 – 162 volts when disable test is performed.

1. Turn ON Transistor Q533.
   Connect a 33k resistor jumper as follows:
   - Q533 – base to TPD7 (+12V)

Horizontal frequency should increase as the transistor is activated.

2. If Q533 turns ON, check voltage at base. If low or zero, check D533, R534, R532, C531, D531, R531 and the amplitude of waveform at Pin 6 of flyback transformer T551.



New Circuits

CRT Protection Circuit

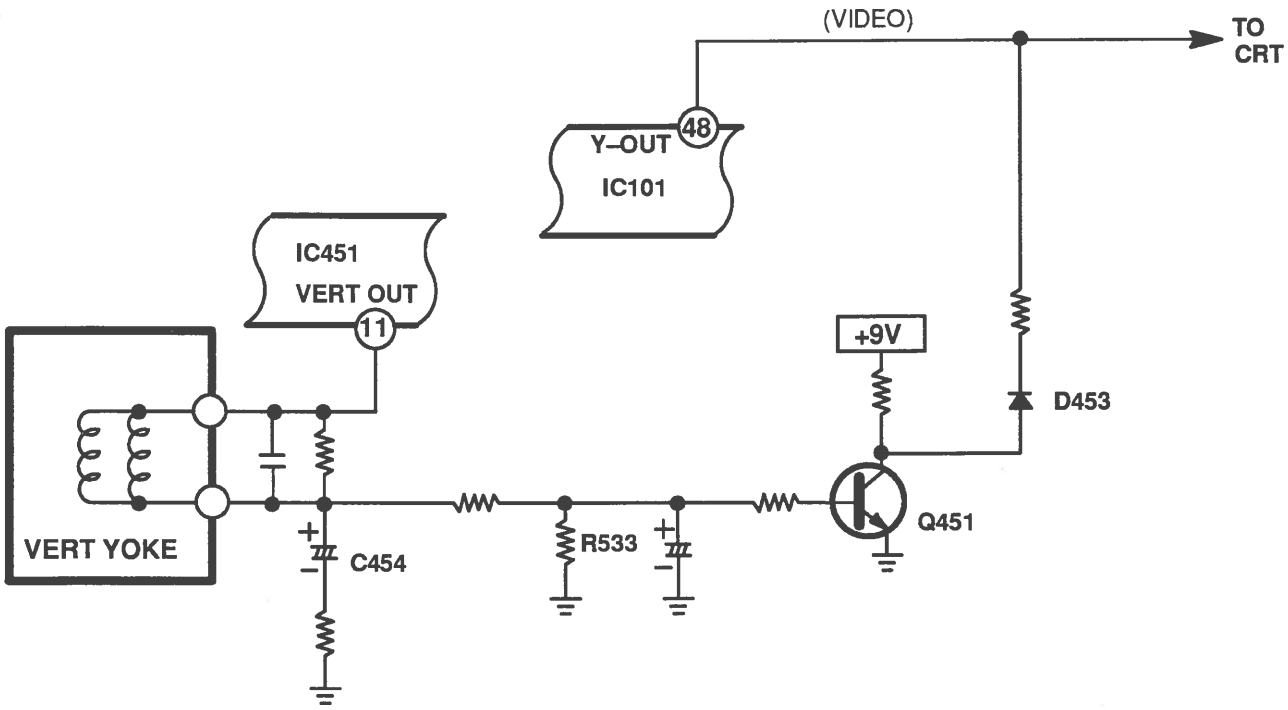
This circuit blanks the CRT in the event of vertical sweep loss and also functions as a CRT spot killer when the Receiver is turned OFF.

During normal operation the vertical sweep waveform from vertical output (IC451) supplies a positive voltage to the base of Q451. Its conduction grounds the anode of D453 and the diode does not conduct, to allow normal video.

Any failure mode causing loss of the vertical sweep waveform will allow the charge on C454 to discharge and results in the voltage at the base of Q451 to decrease and stop its conduction. This allows D453 to conduct and supply roughly +9 volts to the video path going to the CRT. The increased DC voltage drives the video information into the black area and blanks the CRT.

When the Receiver is turned OFF, the vertical sweep waveform disappears but the +9 volts decays slowly. Thus the circuit operates to blank the CRT to provide spot burn protection.

Note that any failure mode causing transistor Q451 to be non–conductive will result in the CRT to blank. The easiest way to confirm that the blanking circuit is active, causing a no raster symptom, is to measure the collector voltage of Q451. If it is approximately +9 volts, then D453 is conducting to cause CRT blanking.



REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
		CAPACITORS
C001	ECKF1H103ZF	CAP,C .01UF–Z–50V
C002	ECEA1EU4R7	CAP,E 4.7UF/25V
C004	ECKF1H101KB	CAP,C 100PF–K–50V
C009	ECEA1HU010	CAP,E 1UF/50V
C013	ECKF1H103ZF	CAP,C .01UF–Z–50V
C014	ECEA0JU102	CAP,E 1000UF/6.3V
C017	ECEA0JU101	CAP,E 100UF/6.3V
C018	ECEA1CU100	CAP,E 10UF/16V
C019	ECKF1H103ZF	CAP,C .01UF–Z–50V
C021	ECKF1H821KB	CAP,C 820PF–K–50V
C022	ECCF1H330JP	CAP,C 33PF–J–50V
C023	ECCF1H150JP	CAP,C 15PF–J–50V
C024	ECEA0JU331	CAP,E 330UF/6.3V
C025	ECKF1H561KB	CAP,C 560PF–K–50V
C026	ECEA1CU102	CAP,E 1000UF/16V
C027	ECEA1CU100	CAP,E 10UF/16V
C028	ECEA1CU100	CAP,E 10UF/16V
C029	ECKF1H103ZF	CAP,C .01UF–Z–50V
C030	ECEA1CU100	CAP,E 10UF/16V
C031	ECRHA030E81	TRIMMER: 30PF
C034	ECKF1H103ZF	CAP,C .01UF–Z–50V
C035	ECKF1H103ZF	CAP,C .01UF–Z–50V
C036	ECEA0JU101	CAP,E 100UF/6.3V
C044	ECKF1H103ZF	CAP,C .01UF–Z–50V
C045	ECEA1CU471	CAP,E 470UF/16V
C057	ECEA1CU100	CAP,E 10UF/16V
C071	ECKF1H103ZF	CAP,C .01UF–Z–50V
C103	ECCF1H020CC	CAP,C 2PF–C–50V
C104	ECCF1H020CC	CAP,C 2PF–C–50V
C105	ECKF1H103ZF	CAP,C .01UF–Z–50V
C106	ECKF1H103ZF	CAP,C .01UF–Z–50V
C109	ECEA50ZR22	CAP,E .22UF/50V
C110	ECEA50ZR47	CAP,E .47UF/50V
C112	ECCF1H180JC	CAP,C 18PF–J–50V
C115	ECEA1AU101	CAP,E 100UF/10V
C119	ECQM1H183KV	CAP,P .018UF–K–50V
C120	ECEA0JU101	CAP,E 100UF/6.3V
C121	ECKF1H103ZF	CAP,C .01UF–Z–50V
C126	ECKF1H103ZF	CAP,C .01UF–Z–50V
C151	ECCF1H680JC	CAP,C 68PF–J–50V
C152	ECCF1H150JC	CAP,C 15PF–J–50V
C153	ECKF1H103ZF	CAP,C .01UF–Z–50V
C154	ECEA1HUR22	CAP,E .22UF/50V
C155	ECCF1H020CC	CAP,C 2PF–C–50V
C201	ECQM1H682KV	CAP,P .0068UF–K–50V
C202	ECEA1HU010	CAP,E 1UF/50V
C203	ECKF1H103ZF	CAP,C .01UF–Z–50V
C204	ECEA1HU010	CAP,E 1UF/50V
C205	ECEA1HU010	CAP,E 1UF/50V
C207	ECCF1H680KP	CAP,C 68PF–K–50V
C208	ECEA1CU220	CAP,E 22UF/16V
C209	ECKF1H332KB	CAP,C .0033UF–K–50V
C210	ECEA1CU100	CAP,E 10UF/16V
C211	ECEA1EU471	CAP,E 470UF/25V
C212	ECKF1H103ZF	CAP,C .01UF–Z–50V
C213	ECEA1EU221	CAP,E 220UF/25V
C214	ECEA1CU100	CAP,E 10UF/16V
C215	ECQM1H683KV	CAP,P .068UF–K–50V
C301	ECEA1CN330S	CAP,E 33UF/16V
C302	ECEA1CU330	CAP,E 33UF/16V
C305	ECEA1CU100	CAP,E 10UF/16V
C306	ECEA1CU100	CAP,E 10UF/16V
C307	ECEA1HUR22	CAP,E .22UF/50V
C309	ECEA1HU010	CAP,E 1UF/50V
C310	ECEA1HU010	CAP,E 1UF/50V
C312	ECEA1CU220	CAP,E 22UF/16V
C314	ECCF1H330JC	CAP,C 33PF–J–50V
C350	ECKD3D681KB	CAP,C 680PF–K–2KV
C351	ECKF1H681KB	CAP,C 680PF–K–50V
C352	ECKF1H561KB	CAP,C 560PF–K–50V
C353	ECKF1H681KB	CAP,C 680PF–K–50V
C355	ECKD2H102KB	CAP,C .001UF–K–500V
C360	ECKF1H331KB	CAP,C 330PF–K–50V
C361	ECEA2AU100	CAP,E 10UF/100V
C401	ECEA1HU010	CAP,E 1UF/50V
C402	ECQM1H223KV	CAP,P .022UF–K–50V
C403	ECEA1HU2R2	CAP,E 2.2UF/50V
C405	ECKF1H122KB	CAP,C .0012UF–K–50V
C451	ECEA1CU101	CAP,E 100UF/16V
C452	ECSF25E1VB	CAP,T 1.0UF/25V
C453	ECEA50Z1R5	CAP,E 1.5UF/50V
C454	ECEA1CU222	CAP,E 2200UF/16V
C455	ECEA1VU101	CAP,E 100UF/35V
C457	ECEA1HU0R1	CAP,E .1UF/50V
C458	ECEA1CU100	CAP,E 10UF/16V
C460	ECKD2H101KB	CAP,C 100PF–K–500V
C501	ECQM1H822KV	CAP,P .0082UF–K–50V
C502	ECQM1H183KV	CAP,P .018UF–K–50V
C503	ECCF1H221JU	CAP,C 220PF–J–50V
C504	ECEA1AU101	CAP,E 100UF/10V
C505	ECKF1H221KB	CAP,C 220PF–K–50V
C506	ECEA1HU010	CAP,E 1UF/50V
C507	ECQM1H333KV	CAP,P .033UF–K–50V
C510	ECQM1H473KV	CAP,P .047UF–K–50V
C512	ECKF1H561KB	CAP,C 560PF–K–50V
C513	**ECCD2H100F**	**CAP,C 10PF–F–500V**
C514	**ECKD2H821KB**	**CAP,C 820PF–K–500V**
C515	**ECKD2H821KB**	**CAP,C 820PF–K–500V**
C518	ECQM1H223KV	CAP,P .022UF–K–50V
C531	**ECEA1EU330**	**CAP,E 33UF/25V**
C541	ECKF1H122KB	CAP,C .0012UF–K–50V
C551	**ECQF2H224JS**	**CAP,P .22UF–J–200V**
C552	**ECEA1EU221**	**CAP,E 220UF/25V**
C553	**ECEA2EU220**	**CAP,E 22UF/250V**
C554	**ECKD2H561KB**	**CAP,C 560PF–K–500V**
C555	**ECKD2H561KB**	**CAP,C 560PF–K–500V**
C557	ECEA1HU2R2	CAP,E 2.2UF/50V
C558	ECEA1AU331	CAP,E 330UF/10V
C559	**ECEA1EGE221**	**CAP,E 220UF/25V**
NOTE:	**REPLACE C562**	**WITH ORIGINAL VALUE ONLY**
C562	**ECKD3D102JB**	**CAP,C .001UF–J–2KV**
——	**ECKD3D122JB**	**CAP,C .0012UF–J–2KV**
——	**ECKD3D152JB**	**CAP,C .0015UF–J–2KV**
C564	**ECWH12H472JS**	**CAP,P .0047UF–J–1.2KV**
C566	**ECEA1VGE221**	**CAP,E 220UF/35V**
C567	ECKF1H103ZF	CAP,C .01UF–Z–50V
C568	**ECKD2H561KB**	**CAP,C 560PF–K–500V**
C570	ECEA1EU221	CAP,E 220UF/25V
C571	ECKF1H103ZF	CAP,C .01UF–Z–50V
C601	ECKF1H103ZF	CAP,C .01UF–Z–50V
C605	ECCF1H080DU	CAP,C 8PF–D–50V
C606	ECEA1HUR47	CAP,E .47UF/50V
C607	ECKF1H101KB	CAP,C 100PF–K–50V
C608	ECKF1H101KB	CAP,C 100PF–K–50V
C609	ECKF1H101KB	CAP,C 100PF–K–50V
C611	ECCF1H101JC	CAP,C 100PF–J–50V
C612	ECCF1H101JC	CAP,C 100PF–J–50V
C625	ECEA1CU100	CAP,E 10UF/16V
C626	ECKF1H271KB	CAP,C 270PF–K–50V
C803	**ECKD2H103PU**	**CAP,C .01UF–P–500V CTP–1061R PC–11A50R PC–11A61R QC–11H20R**
——	**ECKD2H472PU**	**CAP,C .0047UF–P–500V CTP–1050R TP1020HH**
C804	**ECKD2H103PU**	**CAP,C .01UF–P–500V CTP–1061R PC–11A50R PC–11A61R QC–11H20R**
——	**ECKD2H472PU**	**CAP,C .0047UF–P–500V CTP–1050R TP1020HH**
C805	**ECES2DU221E4**	**CAP,E 220UF/200V**
C806	**ECEA2CGE100**	**CAP,E 10UF/160V**
C812	**ECEA160V33Z**	**CAP,E 33UF/160V**
C817	**ECQU1A153KH**	**CAP,P .015UF–K–125VAC**

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
C818	**ECQU1A153KH**	**CAP,P .015UF–K–125VAC**
C851	ECEA1VF102X	CAP,E 1000UF/35V CTP–1061R PC–11A61R
C853	ECKD2H331KB	CAP,C 330PF–K–500V CTP–1061R PC–11A61R
C854	ECEA2CS101	CAP,E 100UF/160V CTP–1061R PC–11A61R
C855	ECEA1EU471	CAP,E 470UF/25V CTP–1061R PC–11A61R
C856	ECQM1H472KV	CAP,P .0047UF–K–50V CTP–1061R PC–11A61R
C857	ECEA1HU3R3	CAP,E 3.3UF/50V CTP–1061R PC–11A61R
C858	ECKF1H471KB	CAP,C 470PF–K–50V CTP–1061R PC–11A61R
C859	ECKF1H103ZF	CAP,C .01UF–Z–50V CTP–1061R PC–11A61R
C860	ECEA1CU470	CAP,E 47UF/16V CTP–1061R PC–11A61R
C861	ECQE4105KZ	CAP,P 1.0UF–K–400V CTP–1061R PC–11A61R
C862	ECQM1H823KV	CAP,P .082UF–K–50V CTP–1061R PC–11A61R
C863	ECCF1H330J	CAP,C 33PF–J–50V CTP–1061R PC–11A61R
C864	ECKD2H472KB	CAP,C .0047UF–K–500V CTP–1061R PC–11A61R
C866	ECKD2H103KB	CAP,C .01UF–K–500V CTP–1061R PC–11A61R
C868	ECKF1H102KB	CAP,C .001UF–K–50V CTP–1061R PC–11A61R
C870	ECKF1H121KB	CAP,C 120PF–K–50V CTP–1061R PC–11A61R
C871	ECKF1H103ZF	CAP,C .01UF–Z–50V CTP–1061R PC–11A61R
C885	ECKF1H391KB	CAP,C 390PF–K–50V CTP–1061R PC–11A61R
C3101	ECEA1HU010	CAP,E 1UF/50V
C3102	ECKF1H820JB	CAP,C 82PF–J–50V
C3104	ECEA0JU220	CAP,E 22UF/6.3V
		DIODES
D004	MA165	DIODE
D005	MA4051L	DIODE, ZENER
D020	MA165	DIODE
D021	MA27TA	DIODE
D022	MA165	DIODE
D025	1N4532	DIODE
D031	ERA15–01	DIODE
D032	1N4532	DIODE
D034	SEL1320G	DIODE, LED
D040	MA165	DIODE CTP–1061R PC–11A61R
D302	MA165	DIODE
D451	ERA15–01	DIODE
D452	MA165	DIODE
D453	MA165	DIODE
D456	MA4120M	DIODE
D457	MA4110	DIODE, ZENER
D502	MA4082	DIODE
D503	MA165	DIODE
D504	MA165	DIODE CTP–1061R PC–11A61R
D505	MA165	DIODE CTP–1061R PC–11A61R
D506	MA4062	DIODE
D531	**AS01**	**DIODE**
D532	MA4110	DIODE, ZENER
D533	**TVSQA208G**	**DIODE, ZENER**
D541	MA4051M	DIODE, ZENER
D551	**RU2N**	**DIODE**
D552	**AS01**	**DIODE**
D553	**AS01**	**DIODE**
D554	**AS01**	**DIODE**
D555	MA165	DIODE
D556	MA1360H	DIODE, ZENER
D557	TVSQB105N	DIODE, ZENER
D560	TVSQB109SA	DIODE, ZENER
D603	MA165	DIODE
D801	**EM02BM**	**DIODE**
D802	**EM02BM**	**DIODE**
D803	**EM02BM**	**DIODE**
D804	**EM02BM**	**DIODE**
D806	**ERPF5B0M080F**	**THERMISTOR,DEGAUSSING** **CTP–1050R PC–11A50R** **QC–11H20R TP1020HH**
D851	TVSEU2A	DIODE CTP–1061R PC–11A61R
D852	RGP10J	DIODE CTP–1061R PC–11A61R
D853	**TVSRD6.2EB**	**DIODE, ZENER** **CTP–1061R PC–11A61R**
D855	MA165	DIODE CTP–1061R PC–11A61R
D856	MA165	DIODE CTP–1061R PC–11A61R
D857	RGP10J	DIODE CTP–1061R PC–11A61R
D858	AS01	DIODE CTP–1061R PC–11A61R
D860	MA4062M	DIODE CTP–1061R PC–11A61R
D861	AS01	DIODE CTP–1061R PC–11A61R
D862	MA4062L	DIODE, ZENER CTP–1061R PC–11A61R
D863	MA165	DIODE CTP–1061R PC–11A61R
D864	ERA22–04	DIODE, ZENER CTP–1061R PC–11A61R
D865	MA165	DIODE CTP–1061R PC–11A61R
D867	MA165	DIODE CTP–1061R PC–11A61R
D868	AS01	DIODE CTP–1061R PC–11A61R
D869	AS01	DIODE CTP–1061R PC–11A61R
D3100	MA4110	DIODE, ZENER
D3101	MA4110	DIODE, ZENER
		FUSES
F001	**XBA1C40NU100**	**FUSE 4.0A/125V**
F852	**XBA1F70NU100**	**FUSE 7.0A/125V (CAR BATTERY CORD) CTP–1061R PC–11A61R**
		INTEGRATED CIRCUITS
IC001	MN15151Q14R	INT CKT
IC101	**AN5160NK–N**	**INT CKT**
IC201	AN5265	INT CKT
IC451	LA7835–TV	INT CKT
IC551	**AN78M12**	**PLUS 12V AVR**
IC801	**TVSSTR30130**	**INT CKT**
IC851	AN5900	REGULATOR CONTROL CTP–1061R PC–11A61R
IC1101	TNQ2682A	RECEIVER, REMOTE CONTROL
IC3100	TVSUPD4053BC	INT CKT
		COILS
L006	TLUABTA5R6K	COIL, PEAKING 5.6UH
L007	TLUABTA5R6K	COIL, PEAKING 5.6UH
L008	TLUABTA5R6K	COIL, PEAKING 5.6UH
L010	EXCELSA24	FERRITE BEAD

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
L011	TLUABTA1R0K	COIL, PEAKING 1.0UH
L103	TLI67394–1	COIL, AFT
L104	TLQ012K205C	COIL, PEAKING 1.2UH
L105	TLI158755	COIL, VCO
L106	TLUABTA150K	COIL, PEAKING 15UH
L108	TLQ012K205C	COIL, PEAKING 1.2UH
L109	EXCELSA35	FERRITE BEAD
L201	TLS63318–2	COIL, QUADRATURE
L301	ELB5A082	3.58MHZ TRAP
L354	TLUABTA151K	COIL, PEAKING 150UH
L556	**EXCELSA24**	**FERRITE BEAD**
L561	EXCELSA24	FERRITE BEAD
L570	**0LY15306F**	**YOKE, DEFLECTION**
L601	TLUABTA100K	COIL, PEAKING 10UH
L801	**ELF18D217**	**CHOKE, AC LINE** **CTP–1050R TP1020HH**
——	**ELF18D219**	**CHOKE, AC LINE** **CTP–1061R PC–11A50R** **PC–11A61R**
L804	**0LK19030M**	**COIL, DEGAUSSING**
L851	TLT056K109R	COIL, PEAKING 5.6UH CTP–1061R PC–11A61R
L852	TLT056K109R	COIL, PEAKING 5.6UH CTP–1061R PC–11A61R
L853	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L854	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L855	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L856	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L857	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L858	TSC909	FERRITE BEAD CTP–1061R PC–11A61R
L860	TLT151K991R	COIL, PEAKING 150UH CTP–1061R PC–11A61R
L861	TLP408C	FERRITE BEAD CTP–1061R PC–11A61R
		TRANSISTORS
Q001	2SC1685QR	TRANSISTOR
Q002	2SA564AQR	TRANSISTOR
Q004	2SC1685QR	TRANSISTOR
Q005	2SA564AQR	TRANSISTOR
Q006	2SC1685QR	TRANSISTOR
Q007	2SC1685QR	TRANSISTOR
Q015	2SA564AQR	TRANSISTOR
Q019	2SC1685QR	TRANSISTOR
Q102	2SC1685QR	TRANSISTOR
Q301	2SC1685QR	TRANSISTOR
Q303	2SA719QR	TRANSISTOR
Q316	2SC1685QR	TRANSISTOR
Q351	2SC1573NC	TRANSISTOR
Q352	2SC1573NC	TRANSISTOR
Q353	2SC1573NC	TRANSISTOR
Q451	2SC1685QR	TRANSISTOR
Q501	**2SC1573AH**	**TRANSISTOR**
Q533	**2SC1685QR**	**TRANSISTOR**
Q541	2SC1685QR	TRANSISTOR
Q551	**2SD1439P**	**TRANSISTOR**
Q601	2SD637QR	TRANSISTOR
Q602	2SD637QR	TRANSISTOR
Q603	2SD637QR	TRANSISTOR
Q604	2SD637QR	TRANSISTOR
Q851	2SC1383NC	TRANSISTOR CTP–1061R PC–11A61R
Q852	2SC3300ALF	TRANSISTOR CTP–1061R PC–11A61R
Q854	2SD637PQR	TRANSISTOR CTP–1061R PC–11A61R
Q855	2SB642QR	TRANSISTOR CTP–1061R PC–11A61R
Q860	2SB641QR	TRANSISTOR CTP–1061R PC–11A61R
Q861	TVS2P5M	GATED DIODE CTP–1061R PC–11A61R
Q3100	2SD637QR	TRANSISTOR
Q3101	2SD637QR	TRANSISTOR
Q3102	2SB642QR	TRANSISTOR
		RELAYS
RL001	**TSE1864**	**RELAY**
		RESISTORS
R001	ERDS2TJ132	RES,C 1.3K–J–1/4
R003	ERD25TJ102	RES,C 1K–J–1/4 CTP–1061R PC–11A61R
R007	ERD25TJ222	RES,C 2.2K–J–1/4
R008	ERDS2TJ182	RES,C 1.8K–J–1/4
R009	ERDS2TJ182	RES,C 1.8K–J–1/4
R013	ERDS2TJ473	RES,C 47K–J–1/4
R016	ERDS2TJ222	RES,C 2.2K–J–1/4
R020	ERDS2TJ392	RES,C 3.9K–J–1/4
R021	ERDS2TJ682	RES,C 6.8K–J–1/4
R022	ERDS2TJ223	RES,C 22K–J–1/4
R023	ERDS2TJ392	RES,C 3.9K–J–1/4
R024	ERDS2TJ134	RES,C 130K–J–1/4
R025	ERDS2TJ331	RES,C 330–J–1/4
R028	ERDS2TJ680	RES,C 68–J–1/4
R030	ERDS2TJ823	RES,C 82K–J–1/4
R031	ERDS2TJ823	RES,C 82K–J–1/4
R035	ERDS2TJ331	RES,C 330–J–1/4
R037	ERDS2TJ562	RES,C 5.6K–J–1/4
R045	ERDS2TJ822	RES,C 8.2K–J–1/4
R049	ERD25TJ223	RES,C 22K–J–1/4
R050	ER0S2CKF1002	RES,M 10K–F–1/4
R051	ER0S2CKF1002	RES,M 10K–F–1/4
R052	ERDS2TJ333	RES,C 33K–J–1/4
R055	ERDS1FJ470	RES,C 47–J–1/2
R056	ERDS2TJ472	RES,C 4.7K–J–1/4 CTP–1061R PC–11A61R
——	ERDS2TJ562	RES,C 5.6K–J–1/4 CTP–1050R PC–11A50R QC–11H20R TP1020HH
R058	ERDS2TJ222	RES,C 2.2K–J–1/4
R059	ERDS2TJ222	RES,C 2.2K–J–1/4
R060	ERDS2TJ332	RES,C 3.3K–J–1/4
R061	ERDS2TJ512	RES,C 5.1K–J–1/4
R065	ERDS2TJ432	RES,C 4.3K–J–1/4
R066	ERDS2TJ332	RES,C 3.3K–J–1/4
R071	ERDS2TJ182	RES,C 1.8K–J–1/4
R072	ERDS2TJ473	RES,C 47K–J–1/4
R074	ERG1SJ683	RES,M 68K–J–1W
R075	ERDS2TJ103	RES,C 10K–J–1/4
R078	ERDS2TJ101	RES,C 100–J–1/4
R079	ERDS2TJ561	RES,C 560–J–1/4
R080	ERDS2TJ391	RES,C 390–J–1/4
R081	ERDS2TJ122	RES,C 1.2K–J–1/4
R083	ERDS2TJ103	RES,C 10K–J–1/4
R085	ERD25TJ393	RES,C 39K–J–1/4
R086	ERDS2TJ473	RES,C 47K–J–1/4
R087	ERDS2TJ472	RES,C 4.7K–J–1/4
R088	ERDS2TJ183	RES,C 18K–J–1/4
R090	ERDS2TJ622	RES,C 6.2K–J–1/4
R092	ERDS2TJ272	RES,C 2.7K–J–1/4
R093	ERDS2TJ472	RES,C 4.7K–J–1/4
R094	ERDS2TJ562	RES,C 5.6K–J–1/4
R095	ERDS2TJ101	RES,C 100–J–1/4
R096	ERDS2TJ101	RES,C 100–J–1/4
R097	ERD25TJ101	RES,C 100–J–1/4
R106	EVN60AA00B53	CONTROL 5K
R107	ERDS2TJ561	RES,C 560–J–1/4

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R108	ERDS2TJ222	RES,C 2.2K–J–1/4
R109	ERDS2TJ221	RES,C 220–J–1/4
R110	ERDS2TJ822	RES,C 8.2K–J–1/4
R111	ERDS2TJ223	RES,C 22K–J–1/4
R112	ERDS2TJ121	RES,C 120–J–1/4
R151	ERDS2TJ274	RES,C 270K–J–1/4
R152	ERDS2TJ104	RES,C 100K–J–1/4
R153	ERDS2TJ472	RES,C 4.7K–J–1/4
R201	ERD25TJ102	RES,C 1K–J–1/4
R202	ERDS2TJ823	RES,C 82K–J–1/4
R203	ERDS2TJ471	RES,C 470–J–1/4
R205	ERDS2TJ681	RES,C 680–J–1/4
R206	ERQ1CJP220	RES,F 22–J–1W
R207	ERD25FJ4R7	RES,C 4.7–J–1/4
R209	ERDS2TJ821	RES,C 820–J–1/4
R210	ERDS2TJ682	RES,C 6.8K–J–1/4
R211	ERDS2TJ222	RES,C 2.2K–J–1/4
R212	ERDS2TJ332	RES,C 3.3K–J–1/4
R213	ERDS2TJ102	RES,C 1K–J–1/4
R214	ERDS2TJ103	RES,C 10K–J–1/4
R251	ERDS2TJ470	RES,C 47–J–1/4
R301	ERDS2TJ471	RES,C 470–J–1/4
R303	ERDS2TJ182	RES,C 1.8K–J–1/4
R304	EVND4AA00B23	CONTROL 2K
R305	ERDS2TJ183	RES,C 18K–J–1/4
R308	ERDS2TJ753	RES,C 75K–J–1/4
R309	ERDS2TJ333	RES,C 33K–J–1/4
R310	ERDS2TJ472	RES,C 4.7K–J–1/4
R311	ERDS2TJ151	RES,C 150–J–1/4
R314	ERDS2TJ561	RES,C 560–J–1/4
R316	ERDS2TJ272	RES,C 2.7K–J–1/4
R317	ERDS2TJ223	RES,C 22K–J–1/4
R318	EVN60AA00B14	CONTROL 10K
R320	ERD25TJ103	RES,C 10K–J–1/4
R323	ERDS2TJ393	RES,C 39K–J–1/4
R324	ERDS2TJ185	RES,C 1.8MEG–J–1/4
R326	ERD25TJ562	RES,C 5.6K–J–1/4
R327	ERDS2TJ102	RES,C 1K–J–1/4
R334	ERDS2TJ102	RES,C 1K–J–1/4
R336	ERDS2TJ222	RES,C 2.2K–J–1/4
R337	ERDS2TJ104	RES,C 100K–J–1/4
R339	ERDS2TJ393	RES,C 39K–J–1/4
R351	ERG1SJ153	RES,M 15K–J–1W
R352	ERG1SJ153	RES,M 15K–J–1W
R354	EVN49AA00B33	CONTROL 3K
R355	EVN49AA00B33	CONTROL 3K
R357	EVN49AA00B32	CONTROL 300 OHM
R358	EVN49AA00B32	CONTROL 300 OHM
R360	ERDS2TJ181	RES,C 180–J–1/4
R361	ERDS2TJ102	RES,C 1K–J–1/4
R363	ERDS2TJ331	RES,C 330–J–1/4
R367	ERDS2TJ221	RES,C 220–J–1/4
R368	ERDS2TJ102	RES,C 1K–J–1/4
R370	ERDS2TJ184	RES,C 180K–J–1/4
R371	ERDS2TJ223	RES,C 22K–J–1/4
R374	ERDS1TJ272	RES,C 2.7K–J–1/2
R375	ERDS1TJ272	RES,C 2.7K–J–1/2
R379	ERDS1TJ272	RES,C 2.7K–J–1/2
R380	ERDS2TJ182	RES,C 1.8K–J–1/4
R381	ERG1SJ153	RES,M 15K–J–1W
R401	ERDS2TJ684	RES,C 680K–J–1/4
R402	ERDS2TJ681	RES,C 680–J–1/4
R403	ERDS2TJ271	RES,C 270–J–1/4
R451	ERD25TJ821	RES,C 820–J–1/4
R452	ERDS2TJ393	RES,C 39K–J–1/4
R453	EVN60AA00B54	CONTROL 50K
R454	ERDS1FJ1R8	RES,C 1.8–J–1/2
R455	ERDS2TJ223	RES,C 22K–J–1/4
R456	ERDS2TJ682	RES,C 6.8K–J–1/4
R457	ERDS2TJ222	RES,C 2.2K–J–1/4
R458	ERDS2TJ223	RES,C 22K–J–1/4
R461	ERDS2TJ103	RES,C 10K–J–1/4
R462	ERDS2TJ103	RES,C 10K–J–1/4
R463	ERDS2TJ104	RES,C 100K–J–1/4
R464	ERDS2TJ223	RES,C 22K–J–1/4
R465	ERD25TJ222	RES,C 2.2K–J–1/4
R466	ERDS2TJ163	RES,C 16K–J–1/4
R471	ERDS2TJ153	RES,C 15K–J–1/4
R501	ERDS2TJ272	RES,C 2.7K–J–1/4
R502	ERDS2TJ222	RES,C 2.2K–J–1/4
R503	ERDS2TJ392	RES,C 3.9K–J–1/4
R505	ERDS2TJ821	RES,C 820–J–1/4
R506	ERDS2TJ472	RES,C 4.7K–J–1/4
R508	ERDS2TJ222	RES,C 2.2K–J–1/4
R509	**ERG2SJS562**	**RES,M 5.6K–J–2W**
R510	**ERG2ANJ332**	**RES,M 3.3K–J–2W**
R512	ERD25TJ332	RES,C 3.3K–J–1/4
R515	ERDS2TJ271	RES,C 270–J–1/4
R516	ERDS2TJ391	RES,C 390–J–1/4
R519	ERDS1FJ470	RES,C 47–J–1/2 CTP–1061R PC–11A61R
R524	ERDS2TJ820	RES,C 82–J–1/4
R531	**ERD25FJ470**	**RES,C 47–J–1/4**
R532	**ER0S2CKF6341**	**RES,M 6.34K–F–1/4**
R533	**ER0S2CKF4641**	**RES,M 4.64K–F–1/4**
R534	ERDS2TJ103	RES,C 10K–J–1/4
R541	ERD25TJ101	RES,C 100–J–1/4
R542	ERDS2TJ103	RES,C 10K–J–1/4
R544	ERDS2TJ223	RES,C 22K–J–1/4
R545	ERDS2TJ332	RES,C 3.3K–J–1/4
R547	ERDS2TJ103	RES,C 10K–J–1/4
R551	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R552	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R553	**ERDS1FJ1R0**	**RES,C 1.0–J–1/2**
R554	ERDS2TJ334	RES,C 330K–J–1/4
R556	ERD25TJ103	RES,C 10K–J–1/4
R557	ERDS2TJ103	RES,C 10K–J–1/4
R558	**ERQ1CJP2R0**	**RES,F 2.0–J–1W**
R559	ERG3ANJ101	RES,M 100–J–3W
R560	ERG2ANJ101	RES,M 100–J–2W
R562	**ERG1SJ122**	**RES,M 1.2K–J–1W**
R569	**ERDS1FJ101**	**RES,C 100–J–1/2**
R570	ERDS2TJ222	RES,C 2.2K–J–1/4
R601	ERD25TJ331	RES,C 330–J–1/4
R604	ERDS2TJ224	RES,C 220K–J–1/4
R609	ERDS2TJ271	RES,C 270–J–1/4
R610	ERDS2TJ271	RES,C 270–J–1/4
R611	ERDS2TJ271	RES,C 270–J–1/4
R615	ERDS2TJ102	RES,C 1K–J–1/4
R616	ERDS2TJ102	RES,C 1K–J–1/4
R617	ERDS2TJ622	RES,C 6.2K–J–1/4
R618	ERDS2TJ103	RES,C 10K–J–1/4
R619	EVN60AA00B53	CONTROL 5K
R620	ERDS2TJ102	RES,C 1K–J–1/4
R621	ERD25TJ822	RES,C 8.2K–J–1/4
R622	ERDS2TJ822	RES,C 8.2K–J–1/4
R623	ERDS2TJ272	RES,C 2.7K–J–1/4
R624	ERDS2TJ392	RES,C 3.9K–J–1/4
R626	ERDS2TJ152	RES,C 1.5K–J–1/4
R628	ERDS2TJ272	RES,C 2.7K–J–1/4
R629	ERDS2TJ822	RES,C 8.2K–J–1/4
R630	ERDS2TJ272	RES,C 2.7K–J–1/4
R631	ERDS2TJ471	RES,C 470–J–1/4
R632	ERDS2TJ152	RES,C 1.5K–J–1/4
R801	**ERF3AK5R6**	**RES,W 5.6–K–3W**
R802	**ERF10ZJ221**	**RES,W 220–J–10W**
R804	**ERDS2TJ224**	**RES,C 220K–J–1/4**
R805	**ERDS1TJ103**	**RES,C 10K–J–1/2**
R807	**ERD25FJ470**	**RES,C 47–J–1/4**
R808	**ERD25FJ330**	**RES,C 33–J–1/4**
R810	**ERF3AJ180**	**RES,W 18–J–3W**
R815	**ERC12ZGM825**	**RES,S 8.2MEG–M–1/2**
R851	ERG3SJ330	RES,M 33–J–3W CTP–1061R PC–11A61R
R853	ERDS2TJ472	RES,C 4.7K–J–1/4 CTP–1061R PC–11A61R
R854	**ER0S2CKF1073**	**RES,M 107K–F–1/4 CTP–1061R PC–11A61R**

REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R855	**EVN60AA00B52**	**CONTROL 500 OHM CTP–1061R PC–11A61R**
R856	**ER0S2CKF4871**	**RES,M 4.87K–F–1/4 CTP–1061R PC–11A61R**
R857	ERDS2TJ273	RES,C 27K–J–1/4 CTP–1061R PC–11A61R
R858	ERDS2TJ150	RES,C 15–J–1/4 CTP–1061R PC–11A61R
R859	ERD25TJ102	RES,C 1K–J–1/4 CTP–1061R PC–11A61R
R860	ERDS2TJ562	RES,C 5.6K–J–1/4 CTP–1061R PC–11A61R
R861	ERDS2TJ103	RES,C 10K–J–1/4 CTP–1061R PC–11A61R
R862	ERDS2TJ272	RES,C 2.7K–J–1/4 CTP–1061R PC–11A61R
R863	ERDS2TJ471	RES,C 470–J–1/4 CTP–1061R PC–11A61R
R864	ERDS2TJ102	RES,C 1K–J–1/4 CTP–1061R PC–11A61R
R865	ERDS1TJ105	RES,C 1MEG–J–1/2 CTP–1061R PC–11A61R
R866	ERDS2TJ332	RES,C 3.3K–J–1/4 CTP–1061R PC–11A61R
R867	ERD25FJ150	RES,C 15–J–1/4 CTP–1061R PC–11A61R
R868	ERDS2TJ821	RES,C 820–J–1/4 CTP–1061R PC–11A61R
R869	ERDS2TJ224	RES,C 220K–J–1/4 CTP–1061R PC–11A61R
R870	ERDS2TJ564	RES,C 560K–J–1/4 CTP–1061R PC–11A61R
R871	ERG1ANJ470	RES,M 47–J–1W CTP–1061R PC–11A61R
R873	ERDS2TJ682	RES,C 6.8K–J–1/4 CTP–1061R PC–11A61R
R874	ERDS2TJ822	RES,C 8.2K–J–1/4 CTP–1061R PC–11A61R
R875	ERDS2TJ123	RES,C 12K–J–1/4 CTP–1061R PC–11A61R
R876	ERDS2TJ273	RES,C 27K–J–1/4 CTP–1061R PC–11A61R
R877	ERDS2TJ123	RES,C 12K–J–1/4 CTP–1061R PC–11A61R
R878	ERDS2TJ682	RES,C 6.8K–J–1/4 CTP–1061R PC–11A61R
R879	ERDS2TJ153	RES,C 15K–J–1/4 CTP–1061R PC–11A61R
R880	ERDS2TJ2R2	RES,C 2.2–J–1/4 CTP–1061R PC–11A61R
R892	ERDS1TJ272	RES,C 2.7K–J–1/2 CTP–1061R PC–11A61R
R1101	ERDS2TJ474	RES,C 470K–J–1/4
R3100	ERDS2TJ103	RES,C 10K–J–1/4
R3101	ERDS2TJ122	RES,C 1.2K–J–1/4
R3102	ERDS2TJ223	RES,C 22K–J–1/4
R3103	ERDS2TJ152	RES,C 1.5K–J–1/4
R3104	ERDS2TJ470	RES,C 47–J–1/4
R3105	ERDS2TJ561	RES,C 560–J–1/4
R3106	ERDS2TJ123	RES,C 12K–J–1/4
R3107	ERDS2TJ563	RES,C 56K–J–1/4
R3108	EVN60AA00B14	CONTROL 10K
R3109	ERDS2TJ750	RES,C 75–J–1/4
R3110	ERDS2TJ202	RES,C 2K–J–1/4
R3111	ERDS2TJ183	RES,C 18K–J–1/4
R3112	ERDS2TJ152	RES,C 1.5K–J–1/4
		SWITCHES
S001	EVQQBH12T	SWITCH, PUSH
S002	EVQQBH12T	SWITCH, PUSH
S003	EVQQBH12T	SWITCH, PUSH
S004	EVQQBH12T	SWITCH, PUSH
S005	EVQQBH12T	SWITCH, PUSH
S010	EVQQBH12T	SWITCH, PUSH
S011	EVQQBH12T	SWITCH, PUSH
		TRANSFORMERS
T001	**TLP16297**	**TRANSFORMER, POWER SUPPLY**
T501	**TLH15412**	**TRANSFORMER, HORIZONTAL DRIVER**
T502	**ETE19Z30AY**	**TRANSFORMER, HORIZONTAL COUPLING**
T551	**0LF04701F**	**TRANSFORMER, FLYBACK**
T851	TLP15903	CONVERTER, DRIVE CTP–1061R PC–11A61R
T852	**ETS39K70A**	**TRANSFORMER, DC POWER CTP–1061R PC–11A61R**
		CRYSTALS/FILTERS
X001	TSS2077MX	CRYSTAL, OSCILLATOR
X101	EFCH45MVK12N	SAW FILTER
X102	EFCS4R5MW3BA	4.5MHZ TRAP
X201	EFCS4R5MS4	FILTER 4.5MHZ BANDPASS
X501	EF0A503KS41	CRYSTAL, OSCILLATOR
X601	TSS816MX	CRYSTAL 3.58MHZ OSCILLATOR
		OTHERS
M001	**A26JGZ91X**	**CRT 10"**
M002	EAS7D11KC–G	SPEAKER, 2–3/4' X 1–1/2" 16 OHM
M003	ENV568C4G3	U/V TUNER CTP–1050R TP1020HH
M004	ENV568C5G3	U/V TUNER CTP–1061R PC–11A50R PC–11A61R QC–11H20R
M005	EUR641036	TRANSMITTER, REMOTE CONTROL CTP–1061R PC–11A61R
M006	EUR641037	TRANSMITTER, REMOTE CONTROL QC–11H20R
M007	EUR641573	TRANSMITTER, REMOTE CONTROL TP1020HH
M008	EUR641576	TRANSMITTER, REMOTE CONTROL CTP–1050R PC–11A50R
M009	TBL2A3321	SWIVEL, ARM CTP–1050R CTP–1061R PC–11A50R PC–11A61R QC–11H20R
M010	TBL2A3331	SPACER, SWIVEL MTG.: 5 USED CTP–1050R CTP–1061R PC–11A50R PC–11A61R QC–11H20R
M011	TBL2A3341	BRACKET, SWIVEL ARM SUPPORT CTP–1050R CTP–1061R PC–11A50R PC–11A61R QC–11H20R
M012	TBM2A22701	OVERLAY, INFRA–RED CTP–1050R CTP–1061R PC–11A50R PC–11A61R
M013	TBM2A22801	OVERLAY, INFRA–RED QC–11H20R TP1020HH
M014	TBX2A51403G	ASSY. 7 PUSHBUTTON: CHNL/MENU/PWR/TV VIDEO/ VOL CTP–1050R PC–11A50R
M015	TBX2A51404G	ASSY. 7 PUSHBUTTON: CHNL/MENU/PWR/TV VIDEO/VOL CTP–1061R PC–11A61R
M016	TBX2A51703G	ASSY. 7 PUSHBUTTON: CHNL/MENU/PWR/TV VIDEO/VOL TP1020HH
M017	TBX2A51704G	ASSY. 7 PUSHBUTTON: CHNL/MENU/PWR/TV VIDEO/VOL QC–11H20R
M018	TES202–1	SPRING, DAG GROUND

REPLACEMENT PARTS LIST

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
M019	THT1004	SCREW, CRT MTG.
A/V	TJB2A10001	TERMINAL, A/V INPUT
M020	TJC6320	FUSE HOLDER
M021	TJS1A5150	CRT SOCKET
M022	TLC2042	MAGNET,RINGS:PURITY & STATIC CONV.
M023	TMM2A10802	SPACER, LED
M024	TMM2A18001	WASHER, SWIVEL MOUNT: PLASTIC (5 USED) CTP–1050R CTP–1061R PC–11A61R QC–11H20R
M025	TMW2A9091	STRAIN RELIEF: AC LINE CORD CTP–1050R PC–11A50R QC–11H20R TP1020HH
M026	TPC2A10074	PKG. REGULAR SLTD CARTON QC–11H20R TP1020HH
M027	TPC2A10085	PKG. REGULAR SLTD CARTON CTP–1050R CTP–1061R PC–11A50R PC–11A61R
M028	TQB2A0656	MANUAL, OWNERS': ENGLISH CTP–1050R PC–11A50R
M029	TQB2A0657	MANUAL, OWNERS': ENGLISH QC–11H20R TP1020HH
M030	TQB2A0658	MANUAL, OWNERS': FRENCH PC–11A50R
M031	TQB2A0659	MANUAL, OWNERS': FRENCH QC–11H20R
M032	TQB2A0660	MANUAL, OWNERS': ENGLISH CTP–1061R PC–11A61R
M033	TQB2A0661	MANUAL, OWNERS': FRENCH PC–11A61R
M034	**TSX1174–1**	**AC LINE CORD CTP–1061R PC–11A61R**
M035	**TXASX0111AQM**	**CAR BATTERY CORD CTP–1061R PC–11A61R**
M036	TXFBL011SER	ASSY. SWIVEL MOUNTING BRACKET CTP–1050R CTP–1061R PC–11A61R QC–11H20R
M037	TXFKU571SER	ASSY. CABINET BACK PC–11A50R
M038	TXFKU581SER	ASSY. CABINET BACK PC–11A61R
M039	TXFKU591SER	ASSY. CABINET BACK CTP–1061R
M040	TXFKU601SER	ASSY. CABINET BACK QC–11H20R
M041	TXFKU611SER	ASSY. CABINET BACK CTP–1050R
M042	TXFKU621SER	ASSY. CABINET BACK TP1020HH
M043	TXFKY701SER	ASSY. CABINET FRONT CTP–1050R PC–11A50R
M044	TXFKY711SER	ASSY. CABINET FRONT CTP–1061R PC–11A61R
M045	TXFKY721SER	ASSY. CABINET FRONT TP1020HH
M046	TXFKY731SER	ASSY. CABINET FRONT QC–11H20R
M047	TXF3A011AJM	ASSY. DAG GROUND
M048	**TYPSOCK1AP**	**SOCKET, POWER CTP–1061R PC–11A61R**
M049	T8A262	SILICONE GREASE–HEAT SINK COMPOUND
M050	UR64CS976B	UPPER CASE: TRANSMITTER (EUR641576)
M051	UR64CS977A	BOTTOM CASE: TRANSMOITTER (EUR641576)
M052	UR64EC978	BATTERY COVER: TRANSMITTER (EUR641036 & EUR641037)
M053	UR64EC978A	BATTERY COVER: TRANSMITTER (EUR641573 & EUR641576)

Ref. No.	Part No.	Description
J1	XCJT1A7010	JACK, EARPHONE
M054	0SA100004	ANTENNA, VHF
M055	**0SX110901**	**AC LINE CORD: WHITE TP1020HH**
M056	**0SX110903**	**AC LINE CORD: WHITE CTP–1050R PC–11A50R**
M057	**0SX110904**	**AC LINE CORD: BLACK QC–11H20R**

ABBREVIATION OF PART NAME AND DESCRIPTION

RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Carbon	F	+/– 1%
F	Fuse	J	+/– 5%
M	Metal Oxide	K	+/– 10%
S	Solid	M	+/– 20%
W	Wire Wound	G	+/– 2%

Part No. Description

Example: ERD25TJ104 (C) 100KΩ (J) 1/4W

CAPACITOR

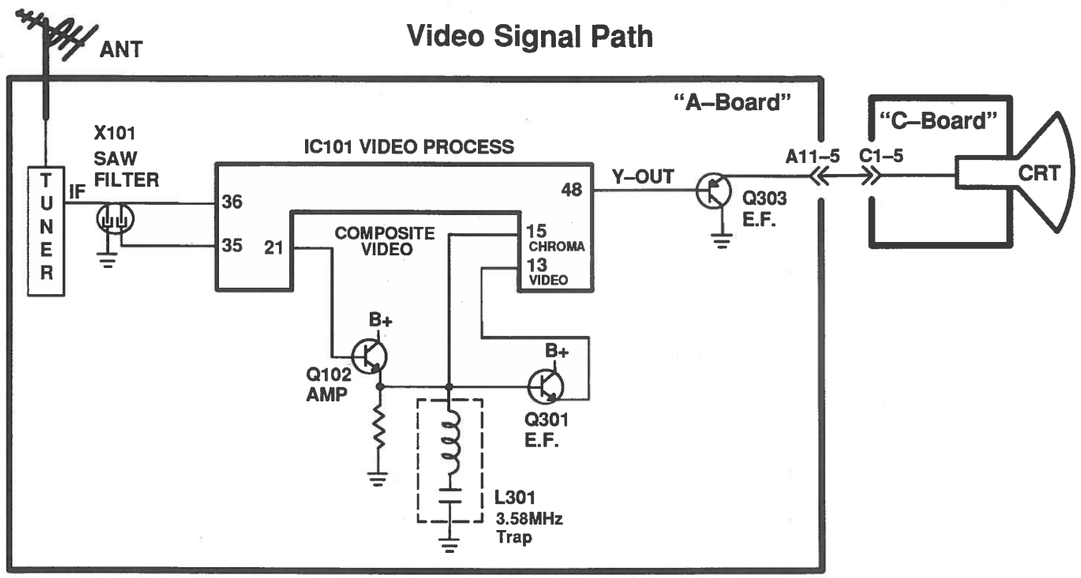
PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Ceramic	C	+/– 0.25pF
E	Electrolytic	D	+/– 0.5pF
P	Polyester	F	+/– 1pF
S	Styrol	J	+/– 5%
T	Tantalum	K	+/– 10%
		L	+/– 15%
		M	+/– 20%
		P	+100% –0%
		Z	+80% –20%

Part No. Description

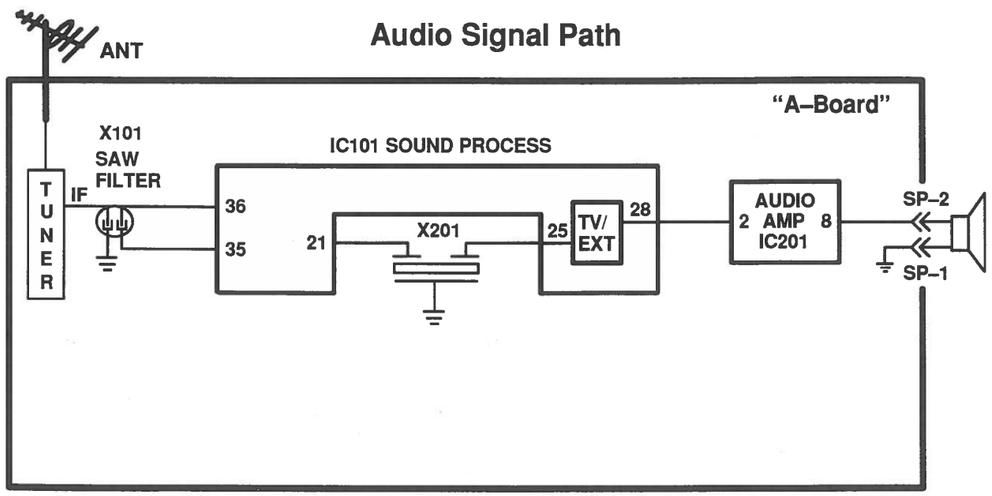
Example: ECKF1H103ZF (C) 0.01µF (Z) 50V

Block Diagrams

Video Signal Path

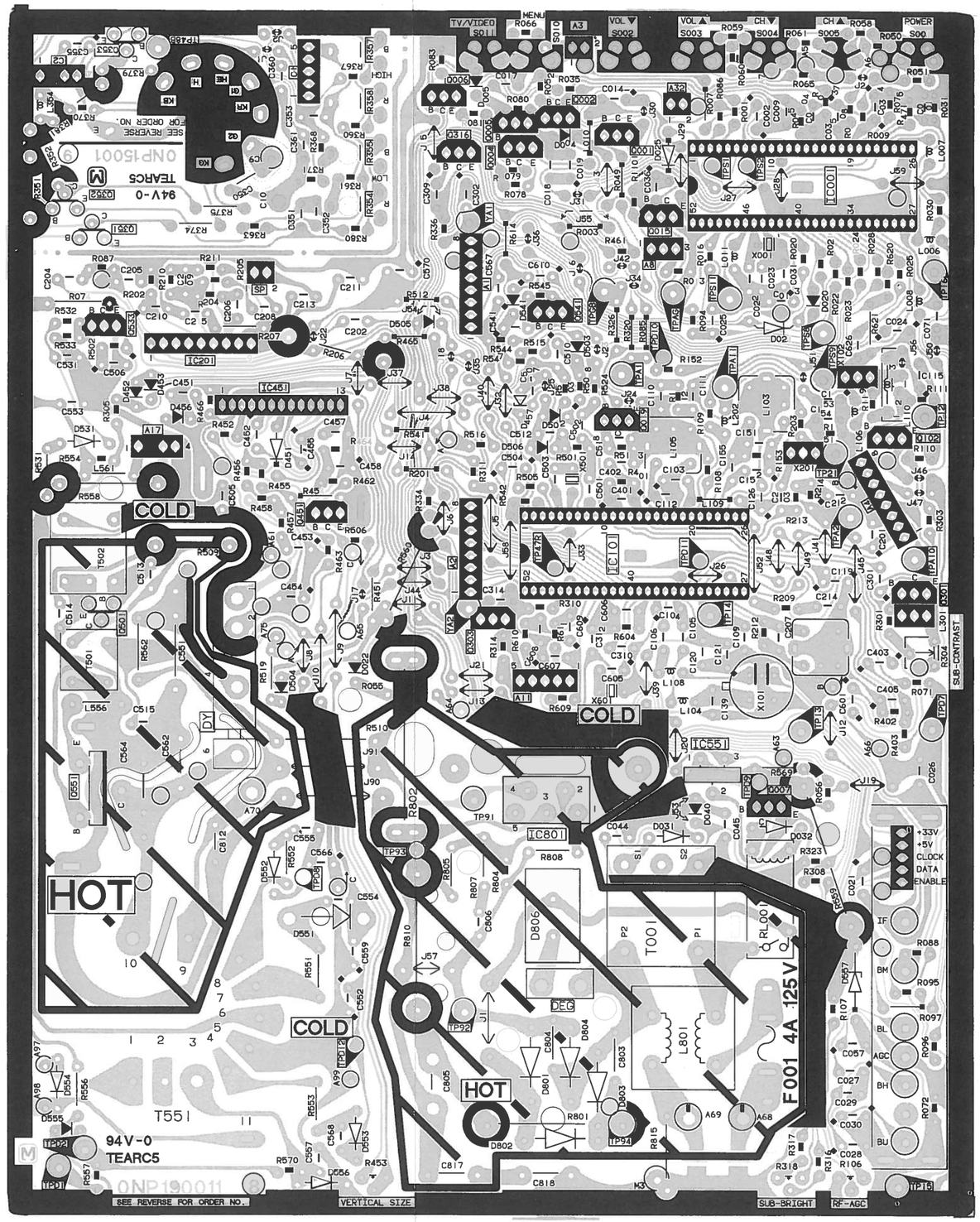


Audio Signal Path



C–Board ONP15001

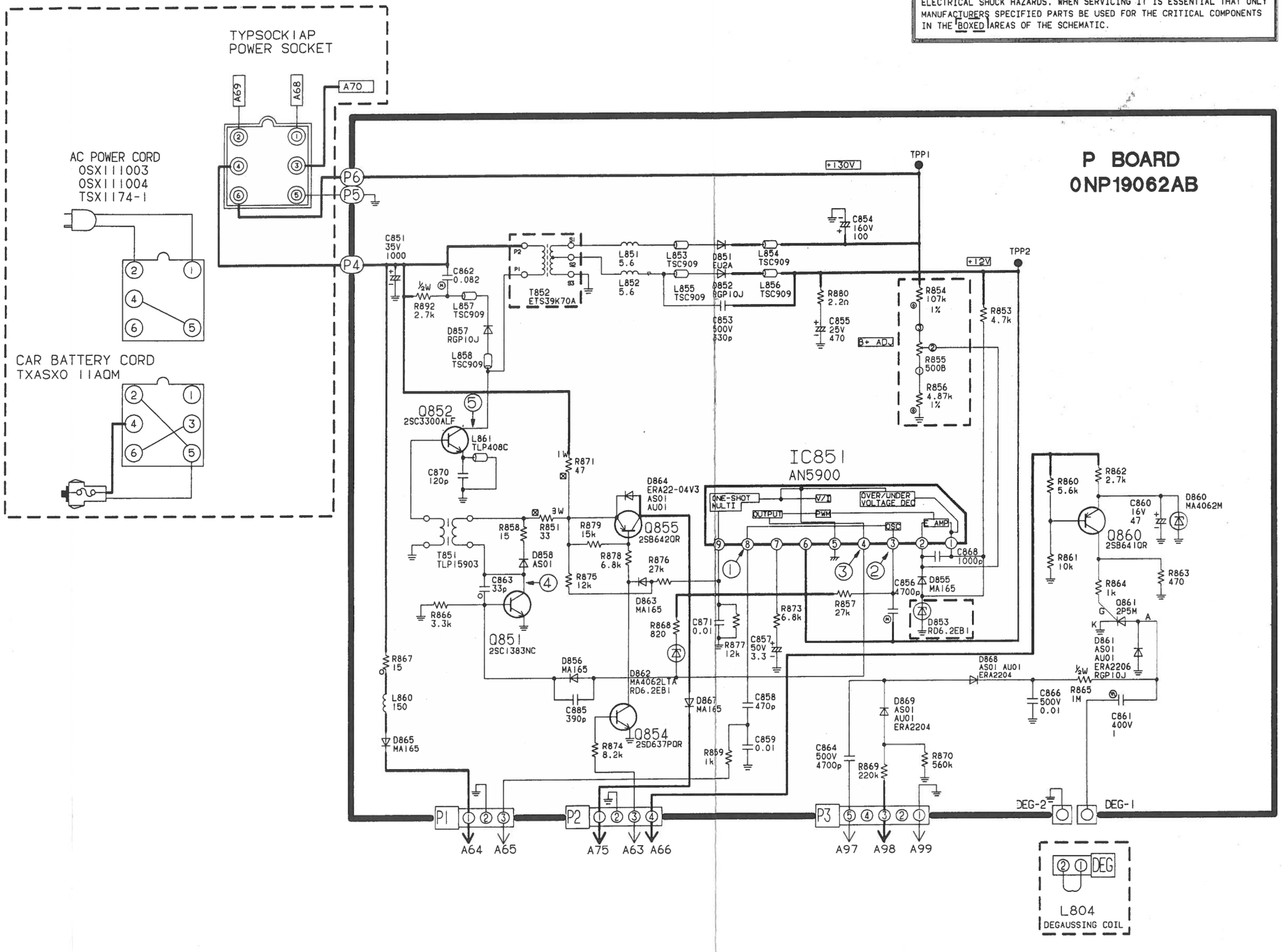
A–Board ONP190011



P–Board Schematic (CTP–1061R & PC–11A61R)

IMPORTANT SAFETY NOTICE

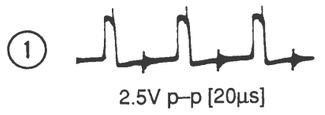
THE BOXED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATIDN FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE BOXED AREAS OF THE SCHEMATIC.



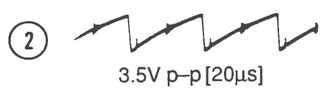
Printed in U.S.A.
92054620F0420

Waveforms – P Schematic

Taken with car battery cord plugged into +12V DC source.



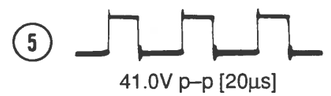
1 — 2.5V p–p [20µs]



2 — 3.5V p–p [20µs]

3 — 2.3V p–p [20µs]

4 — 17.6V p–p [20µs]



5 — 41.0V p–p [20µs]

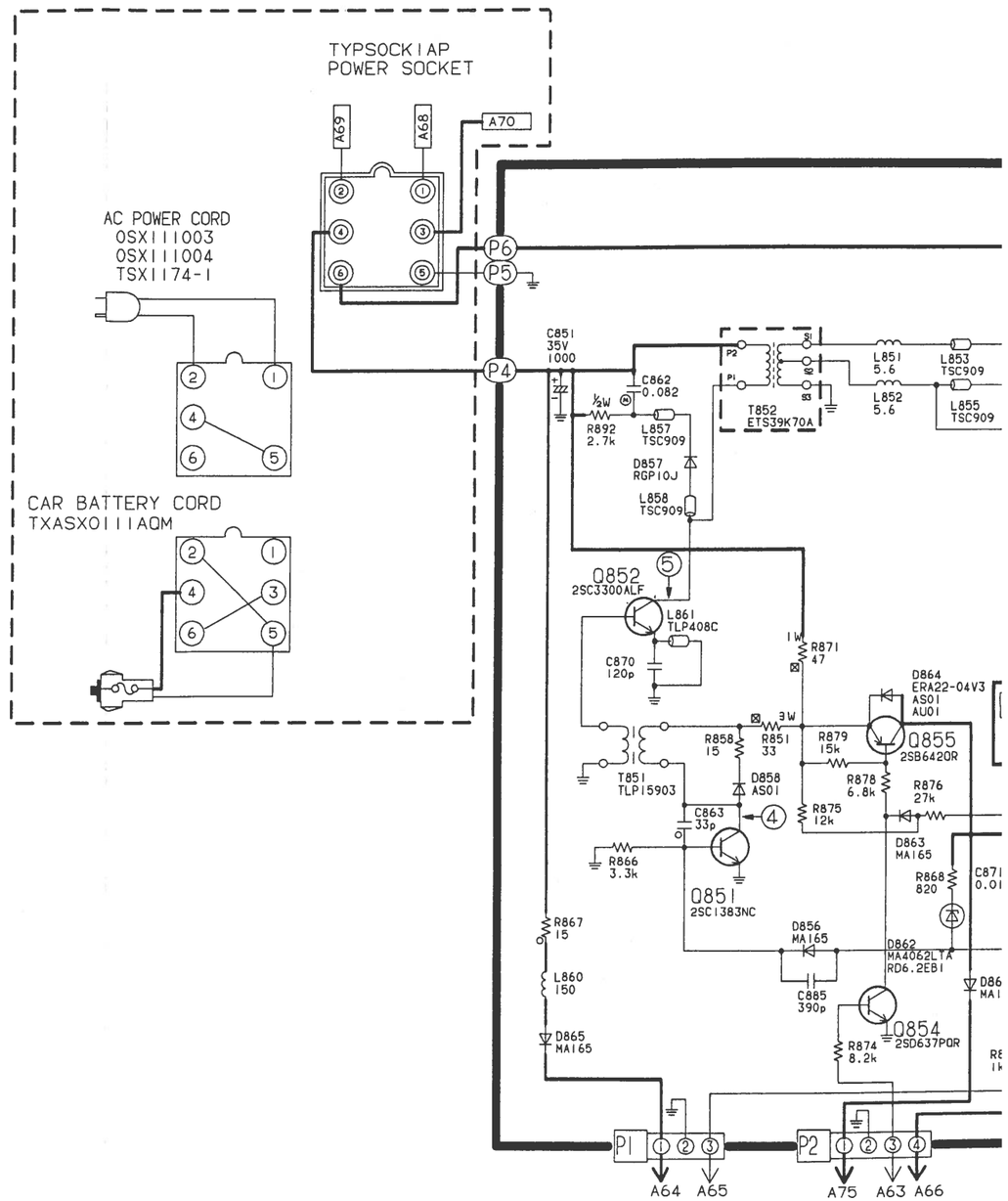
Voltage Chart – P–Board (CTP–1061R & PC–11A61R)

Integrated Circuits (ICs)

IC851	
1	5.9
2	5.9
3	6.1
4	0.6
5	0
6	11.6
7	5.4
8	–0.2
9	0.2

Transistors

Ref.	b	c	e
Q851	0.4	7.5	0
Q852	0	11.9	0
Q854	0.7	0	0
Q855	10.9	11.6	11.2
Q860	7.5	0	6.2



Waveforms – A Schematic

I Waveforms are (⏚) Cold Ground except No. 15 which is (⏚) Hot Ground.

1.5V p–p [20µs]

0.3V p–p [20µs]

3.0V p–p [20µs]

3.3V p–p [20µs]

.96V p–p [20µs]

2.2V p–p [20µs]

1V p–p [20µs]

2.5V p–p [5ms]

7.5V p–p [5ms]

1.6V p–p [5ms]

13 — 54V p–p [5ms]

14 — 3.8V p–p [20µs]

15 — 155.5V p–p [20µs]

16 — 1V p–p [20µs]

17 — 23V p–p [20µs]

18 — 204V p–p [20µs]

19 — 218V p–p [20µs]

20 — 162V p–p [20µs]

21 — 164V p–p [20µs]

Circuit Board Function Index

(CIRCUIT BOARDS)	(FUNCTION)
A–BOARD	MAIN
C–BOARD	CRT
L–BOARD	LED INDICATOR/EARPHONE
P–BOARD	DC POWER SUPPLY
R ASSEMBLY	REMOTE RECEIVER
X–BOARD	A/V SWITCHING
Y–BOARD	SUB TINT

Waveform Measurements

1. Taken with a standard gated rainbow generator connected to antenna terminal.
2. Secondary Operating Controls (Video/Audio Menu) are set to Normalize. Volume "MIN".
3. All video and color waveforms taken with a wideband scope and a probe with low capacity (10 to 1). Shape and peak amplitudes may vary depending on type of Oscilloscope used and calibration.
4. Ground symbol ⏚ (HOT) or ⏚ (COLD) indicates ground lead connection of Oscilloscope.
   CAUTION: Incorrect ground connection of test equipment will result in erroneous readings.

These waveforms have been taken in the order of circuit flow through the various sections as follows:

VIDEO – Waveforms 1~4
COLOR – Waveforms 5~8
VERTICAL – Waveforms 9~13
HORIZONTAL – Waveforms 14~16
POWER SUPPLY – 17~21

Schematic Notes

esistors are carbon 1/4W unless noted otherwise.

6. — **(BOLD LINES)** Indicates the route of B+ supply.

(C

IMPORTANT SAFETY NOTICE

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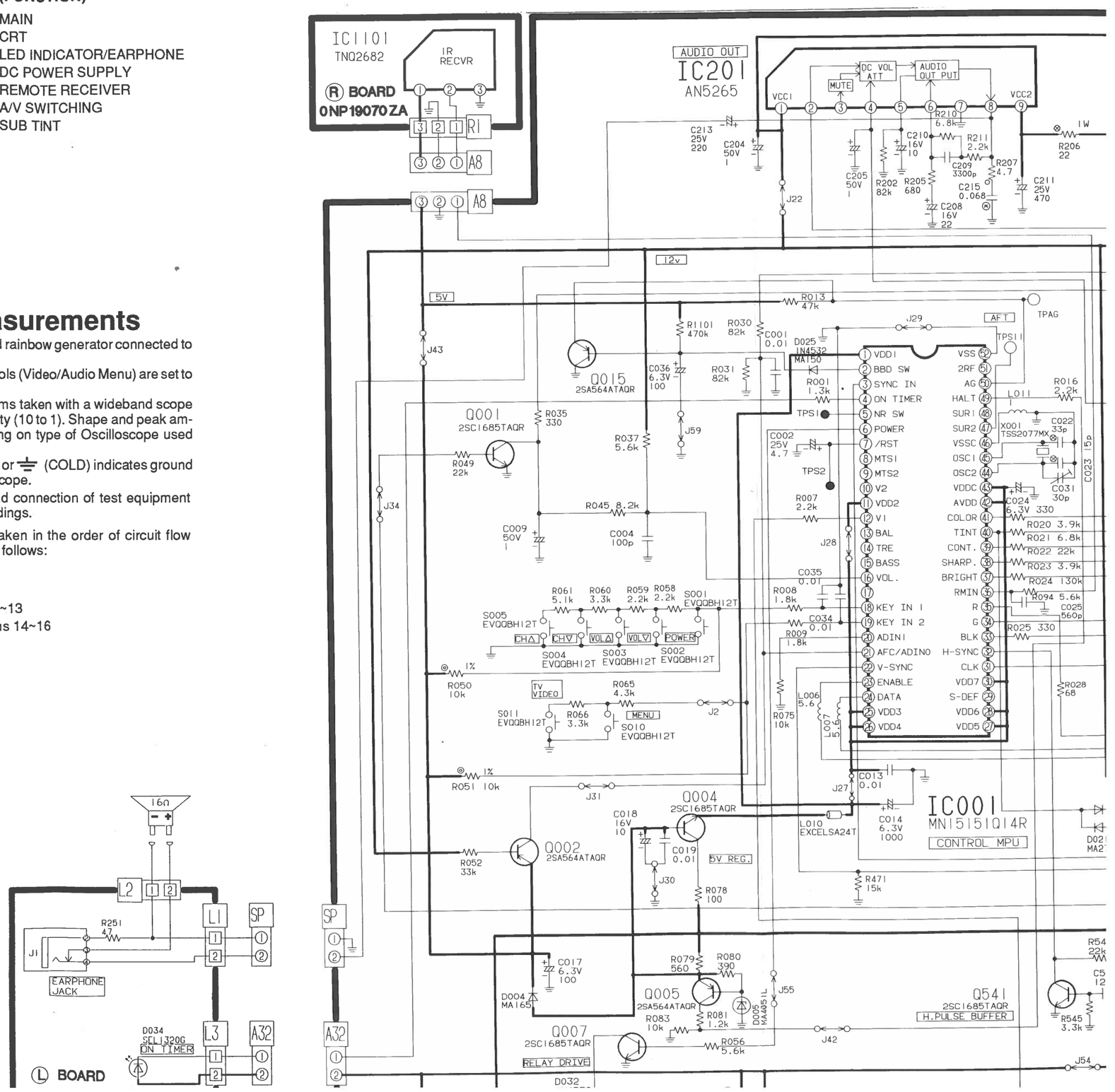
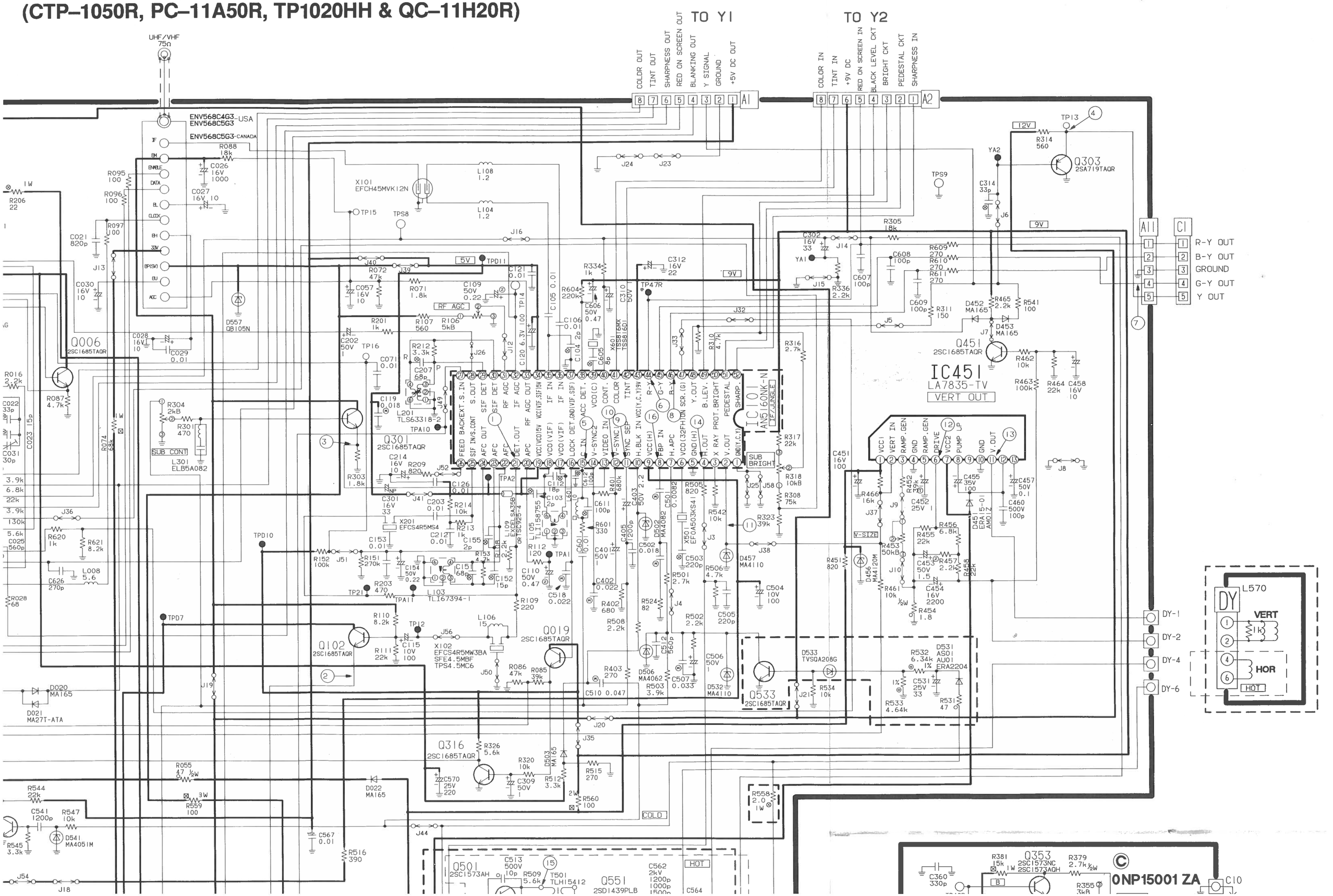


A, C, H, L, R, X & Y–Board Schematics
(CTP–1050R, PC–11A50R, TP1020HH & QC–11H20R)



⑫ 1.6V p–p [5ms]

㉑ 164V p–p [20µs]

Schematic Notes

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value noted is inductance in µH.
4. Test point indicated by ⚲ , Test point but no pin ⚲
5. When arrows [ ] used connections are easily found along with direction of arrow.
6. **— (BOLD LINES)** Indicates the route of B+ supply.
7. This schematic diagram is the latest at the time of printing and subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND CONNECTION** and ⏚ indicates COLD GROUND CONNECTION.

Voltage Measurements

1. Voltage measurement:
   - AC input to Receiver is 120V. Gated rainbow generator connected to antenna of Receiver.
   - All video and audio controls set to normalized position.
     TV ANT mode
     Volume – MIN
   - Voltage readings are nominal and vary ±10% on active devices.
     Some voltage readings will vary with signal strength and picture content.
   - Supply voltages are all nominal.
2. Ground symbol ⏚ or ⏚ indicates ground lead connection of meter. **Caution: Incorrect ground connection will result in erroneous readings.**

Voltage Chart (All Models)

A–Board

Integrated Circuits (ICs)

IC001

1	5.3	27	5.3	1	0	27	2.2
2	0	28	5.3	2	7.1	28	2.0
3	4.2	29	0	3	0	29	2.9
4	12.0	30	5.3	4	0.7	30	2.9
5	0	31	0.1	5	0	31	2.6
6	5.0	32	4.2	6	2.1	32	2.5
7	5.2	33	0.7	7	4.2	33	2.1
8	5.3	34	0.1	8	2.4	34	5.0
9	0	35	0.8	9	6.1	35	2.8
10	0	36	5.3	10	1.4	36	2.8
11	5.3	37	2.5	11	2.6	37	0
12	0	38	2.6	12	7.9	38	7.1
13	0.1	39	5.0	13	2.2	39	3.4
14	0.1	40	2.6	14	5.6	40	4.0
15	0.1	41	2.5	15	7.3	41	2.7
16	0.2	42	5.3	16	8.3	42	3.3
17	0	43	5.3	17	1.5	43	8.9
18	5.3	44	2.2	18	1.5	44	5.3
19	5.3	45	2.3	19	5.0	45	5.4
20	0	46	0	20	1.9	46	5.3
21	1.9	47	5.2	21	3.8	47	0
22	4.3	48	0	22	2.6	48	4.3
23	0.5	49	5.3	23	2.6	49	7.3
24	0.2	50	5.3	24	6.3	50	7.3
25	5.3	51	0	25	3.2	51	7.3
26	5.3	52	0	26	0.5	52	3.3

IC101

1	0	27	2.2
2	7.1	28	2.0
3	0	29	2.9
4	0.7	30	2.9
5	0	31	2.6
6	2.1	32	2.5
7	4.2	33	2.1
8	2.4	34	5.0
9	6.1	35	2.8
10	1.4	36	2.8
11	2.6	37	0
12	7.9	38	7.1
13	2.2	39	3.4
14	5.6	40	4.0
15	7.3	41	2.7
16	8.3	42	3.3
17	1.5	43	8.9
18	1.5	44	5.3
19	5.0	45	5.4
20	1.9	46	5.3
21	3.8	47	0
22	2.6	48	4.3
23	2.6	49	7.3
24	6.3	50	7.3
25	3.2	51	7.3
26	0.5	52	3.3

IC201

1	11.8
2	5.3
3	0
4	0.1
5	8.1
6	8.3
7	0
8	8.3
9	18.7

IC451

1	12.3
2	7.1
3	6.2
4	0
5	6.0
6	6.0
7	25.8
8	1.6
9	1.3
10	0
11	14.0
12	26.2
13	5.2

IC551

1	15.7
2	0
3	11.8

IC801 ⏚

1	0.2
2	130.8
3	143.7
4	129.7
5	0

Transistors

Ref.	b	c	e
Q001	0	0.2	0
Q002	6.1	1.9	5.0
Q004	5.9	9.7	5.2
Q005	5.1	5.9	5.9
Q006	0.2	11.8	0.1
Q007	0.7	0.1	0
Q015	5.2	0	5.3
Q019	8.3	8.9	7.7
Q102	8.3	11.8	7.6
Q301	1.4	11.8	0.8
Q303	4.3	0	4.9
Q316	0.7	0	0
Q451 ⏚	0.6	0.1	0
Q501	0	78.3	0
Q533	0.4	4.2	0
Q541 ⏚	–0.2	4.3	0
Q551	0	135.1	–0.2

C–Board

Transistors

Ref.	b	c	e
Q351	5.1	122.8	4.9
Q352	5.1	122.6	4.9
Q353	5.1	124.3	4.8

X–Board

Integrated Circuits (ICs)

IC851

1	2.8	9	1.3
2	0.7	10	1.3
3	1.0	11	1.3
4	0	12	8.1
5	0	13	0.7
6	0	14	8.1
7	0	15	0
8	0	16	12.0

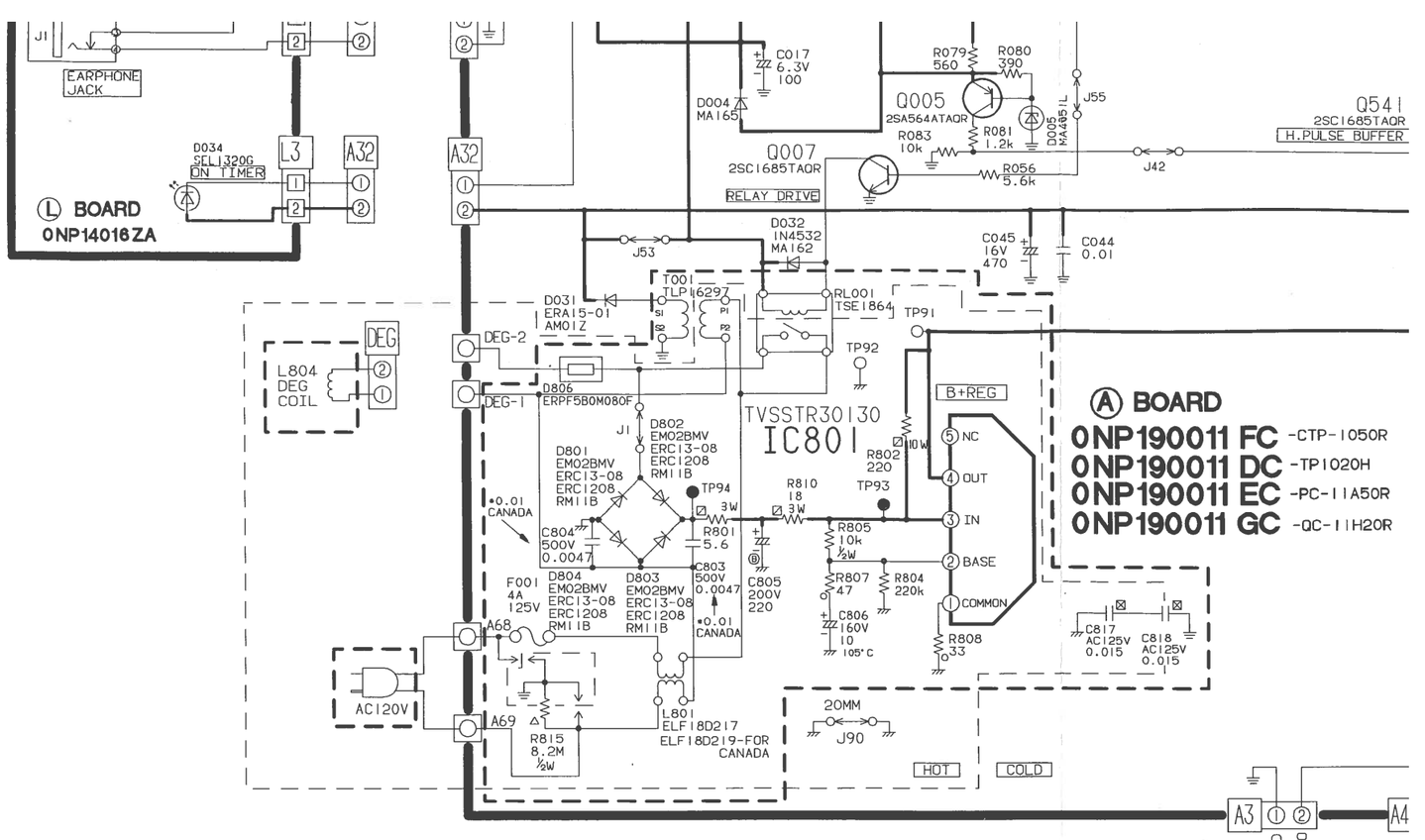
Transistors

Ref.	b	c	e
Q3100	1.3	0.7	2.0
Q3101	8.1	1.2	7.4
Q3102	10.0	1.9	10.7

Y–Panel

Transistors

Ref.	b	c	e
Q601	1.5	1.0	0.9
Q602	1.0	7.8	0.4
Q603	1.9	2.3	1.2
Q604	2.4	7.8	1.7



Important Service Note:
The bottom surface of the printed circuit board is covered with conformal coating.
- Probes must penetrate the conformal coating for proper readings.
- Lightly scrape conformal coating away from areas to be soldered.

Tuner Voltage Chart

U/V tuner voltage test points are located and designated on the circuit side of A–Board.
BP 5V BM 12V AGC 7.5V

Enable, Data, and Clock have no DC readings. They are digital signals from the MPU.
NOTE: Voltage at the 30V test pin varies with channel selection. Please refer to correct chart depending on TV/CATV(CABLE) switch position.

TV Position

	CH	VOLT	CH	VOLT	CH	VOLT
VHF	2	3.7	25	10.7	48	16.4
	3	4.6	26	11.0	49	16.7
	4	5.7	27	11.3	50	16.9
	5	7.8	28	11.5	51	17.2
	6	9.0	29	11.8	52	17.5
	7	7.3	30	12.0	53	17.8
	8	7.8	31	12.3	54	18.1
	9	8.3	32	12.5	55	18.4
	10	8.8	33	12.8	56	18.7
	11	9.4	34	13.0	57	19.1
	12	9.9	35	13.3	58	19.4
	13	10.4	36	13.5	59	19.8
UHF	14	7.7	37	13.7	60	20.2
	15	8.0	38	14.0	61	20.6
	16	8.3	39	14.2	62	21.0
	17	8.6	40	14.5	63	21.5
	18	8.8	41	14.7	64	21.9
	19	9.1	42	14.9	65	22.4
	20	9.4	43	15.2	66	22.9
	21	9.7	44	15.4	67	23.5
	22	9.9	45	15.7	68	24.1
	23	10.2	46	15.9	69	24.7
	24	10.5	47	16.2		

Cable Position

	CH	VOLT	CH	VOLT	CH	VOLT	CH	VOLT
CABLE	01	6.7	26	12.2	51	4.2	76	10.6
	02	3.8	27	12.7	52	4.4	77	10.9
	03	4.7	28	13.1	53	4.7	78	11.2
	04	5.7	29	13.5	54	4.9	79	11.4
	05	7.8	30	14.0	55	5.1	80	11.7
	06	9.1	31	14.5	56	5.3	81	11.8
	07	7.3	32	14.9	57	5.6	82	12.2
	08	7.9	33	15.5	58	5.8	83	12.4
	09	8.4	34	16.0	59	6.1	84	12.7
	10	9.0	35	16.5	60	6.3	85	12.9
	11	9.5	36	17.1	61	6.6	86	13.2
	12	10.0	37	17.7	62	6.8	87	13.4
	13	10.4	38	18.3	63	7.1	88	13.7
	14	18.2	39	19.1	64	7.4	89	13.9
	15	22.0	40	19.8	65	7.6	90	14.1
	16	3.9	41	20.6	66	7.9	91	14.4
	17	4.3	42	21.5	67	8.2	92	14.6
	18	4.7	43	22.5	68	8.5	93	14.9
	19	5.2	44	23.7	69	8.7	94	15.1
	20	5.6	45	24.9	70	9.0	95	10.2
	21	6.3	46	26.3	71	9.3	96	12.0
	22	6.8	47	3.5	72	9.5	97	13.4
	23	10.9	48	3.7	73	9.8	98	14.8
	24	11.3	49	3.9	74	10.1	99	16.5
	25	11.8	50	4.1	75	10.4		

MICROPROCESSOR PROGRAMMING FOR B

54MHz ◄ ► 130MHz ◄

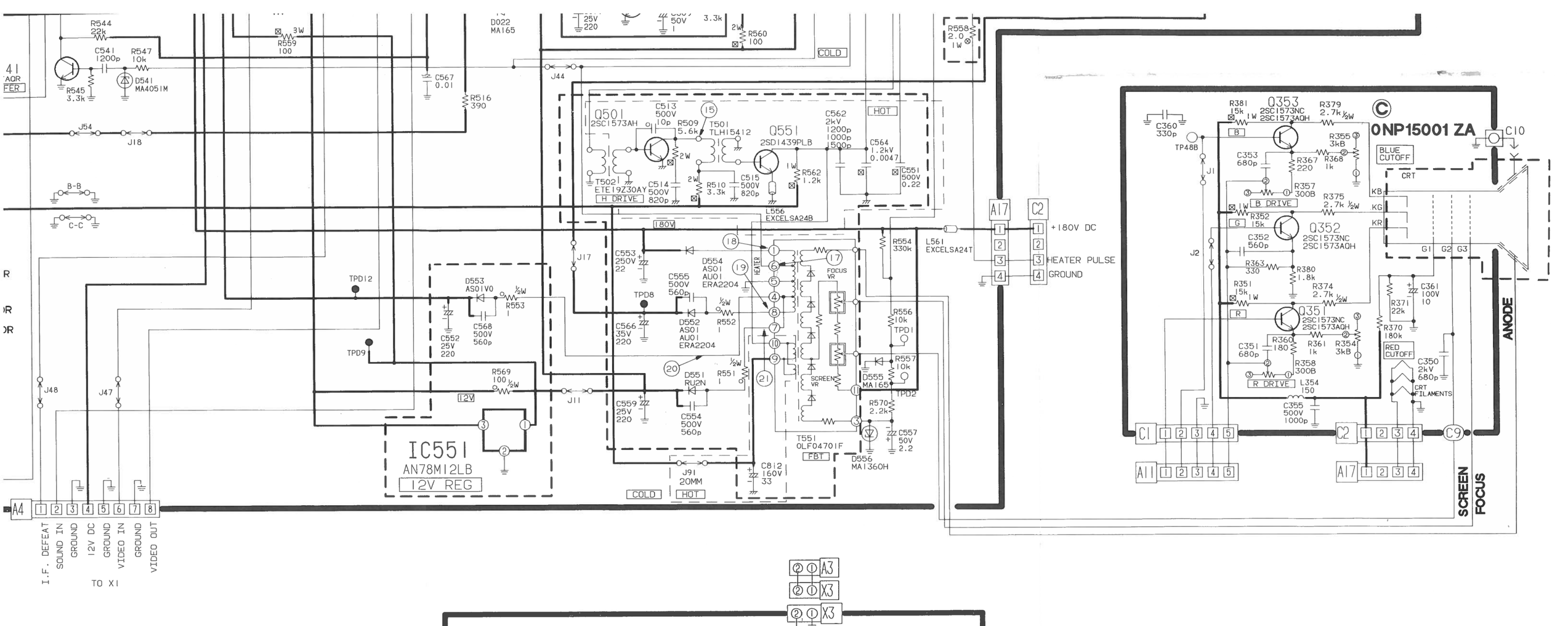
	FIRST TUNING BAND	SECOND TUNING BAND
VHF	02~06	07~13
UHF		
CABLE	01~06,14,15,95~99	07~13,16~4

NOTE: CABLE channel numbers as recommended by Committee and published as EIA INTERIM STANDAR CHANNEL IDENTIFICATION PLAN – MAY 1983.

The Functions listed below are activated by a DC volt (Pin 18 and 19) of MPU IC001. Pins 18 and 19 are r hold function button on Receiver to take voltage readi

FUNCTION	PIN 18
POWER	0V~0.6V
VOL ▼	0.7V~1.2V
VOL ▲	1.3V~1.8V
CH ▼	1.9V~2.4V
CH ▲	2.6V~3.0V
MENU	4.6V~5.0V
TV/VIDEO	4.6V~5.0V

(CTP-1050R, PC-11A50R & QC-11H20R)



R BAND TUNING/SWITCHING

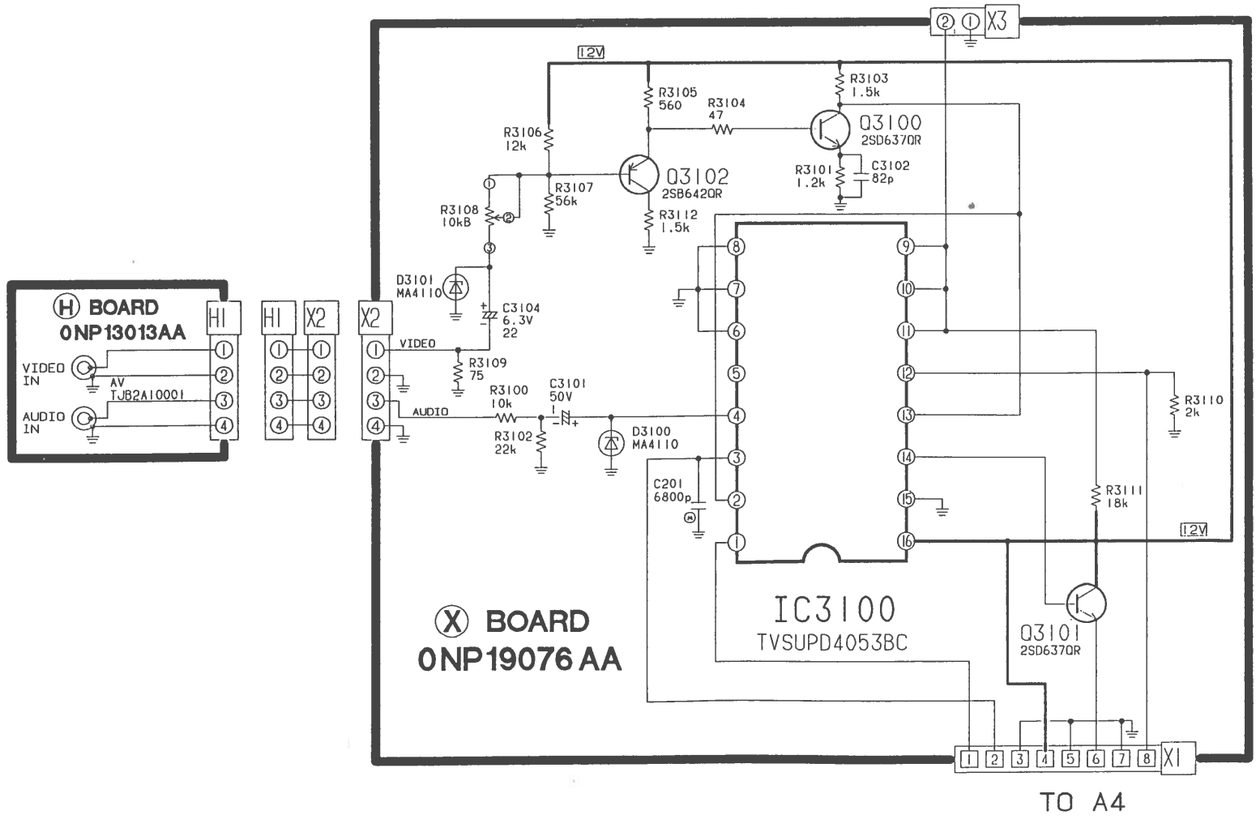
← 360MHz	→ 806MHz
ND NG D	THIRD TUNING BAND
3	
	14~69
6~46	47~94

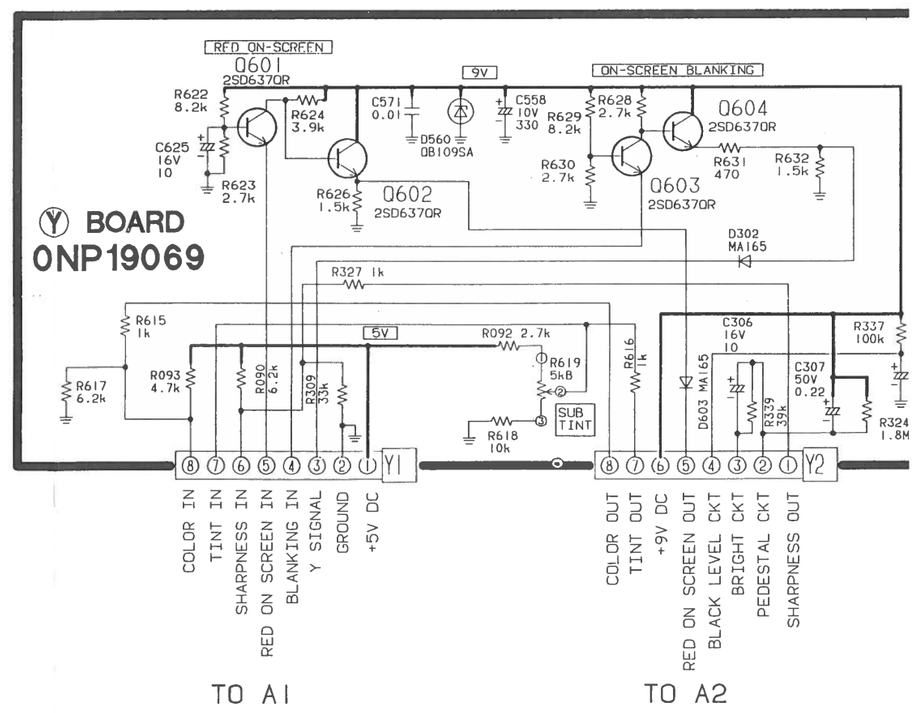
d by the joint EIA/NCTA Engineering
OARD NO. 6 – CABLE TELEVISION

voltage change to DAC Inputs
are normally 4.6V~5.0V. Press and
eadings.

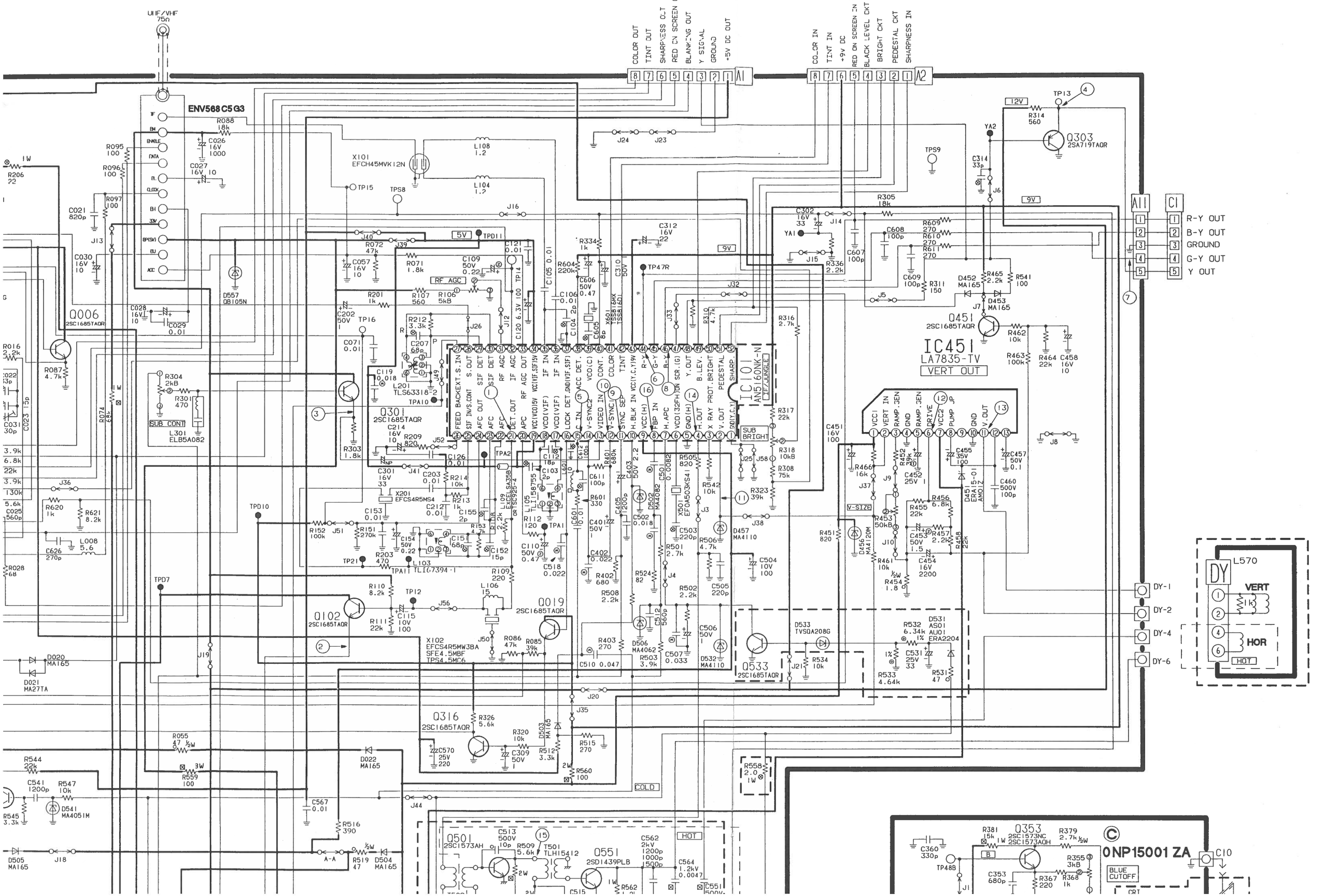
PIN 19

4,6V~5.0V
4.6V~5.0V
4.6V~5.0V
4.6V~5.0V
4.6V~5.0V
1.3V~1.8V
1.9V~2.4V





, H, L, R, X & Y–Board Schematics (CTP–1061R & PC–11A61R)

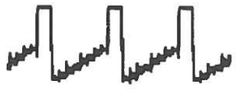


aveforms – A Schematic

'aveforms are (⏚) Cold Ground except No. 15 which is (⏦) Hot Ground.

1.5V p–p [20µs]

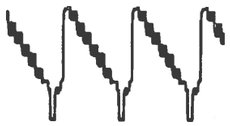
0.3V p–p [20µs]


3.0V p–p [20µs]

3.3V p–p [20µs]

.96V p–p [20µs]

2.2V p–p [20µs]

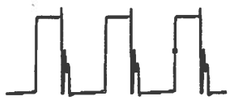

1V p–p [20µs]

2.5V p–p [5ms]

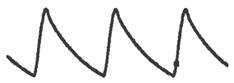
7.5V p–p [5ms]

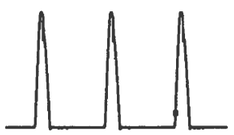
1.6V p–p [5ms]

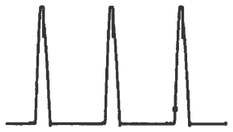
54V p–p [5ms]

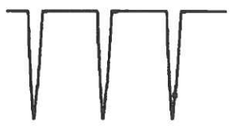

3.8V p–p [20µs]

155.5V p–p [20µs]


1V p–p [20µs]


23V p–p [20µs]


204V p–p [20µs]


218V p–p [20µs]

162V p–p [20µs]

164V p–p [20µs]

Circuit Board Function Index

(CIRCUIT BOARDS)	(FUNCTION)
A–BOARD	MAIN
C–BOARD	CRT
L–BOARD	LED INDICATOR/EARPHONE
P–BOARD	DC POWER SUPPLY
R ASSEMBLY	REMOTE RECEIVER
X–BOARD	A/V SWITCHING
Y–BOARD	SUB TINT

Waveform Measurements

1. Taken with a standard gated rainbow generator connected to antenna terminal.
2. Secondary Operating Controls (Video/Audio Menu) are set to Normalize. Volume "MIN".
3. All video and color waveforms taken with a wideband scope and a probe with low capacity (10 to 1). Shape and peak amplitudes may vary depending on type of Oscilloscope used and calibration.
4. Ground symbol ⏦ (HOT) or ⏚ (COLD) indicates ground lead connection of Oscilloscope.

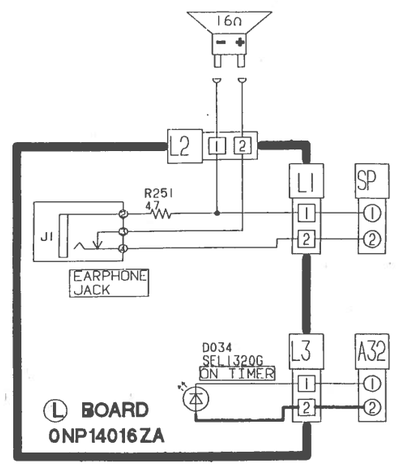
   CAUTION: Incorrect ground connection of test equipment will result in erroneous readings.

These waveforms have been taken in the order of circuit flow through the various sections as follows:

VIDEO – Waveforms 1~4
COLOR – Waveforms 5~8
VERTICAL – Waveforms 9~13
HORIZONTAL – Waveforms 14~16
POWER SUPPLY – 17~21

Schematic Notes

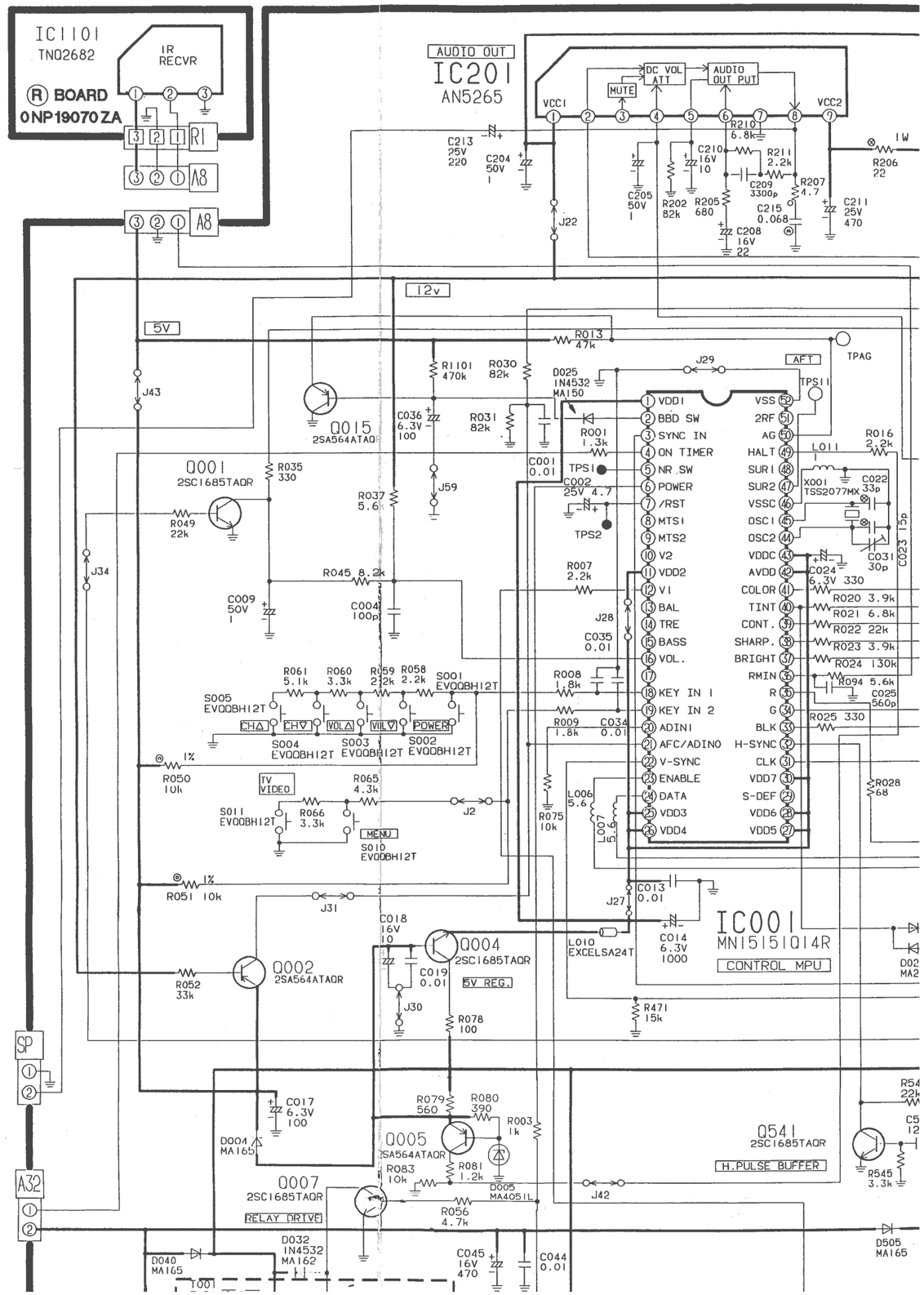
esistors are carbon 1/4W unless noted otherwise. 6. — (BOLD LINES) Indicates the route of B+ supply

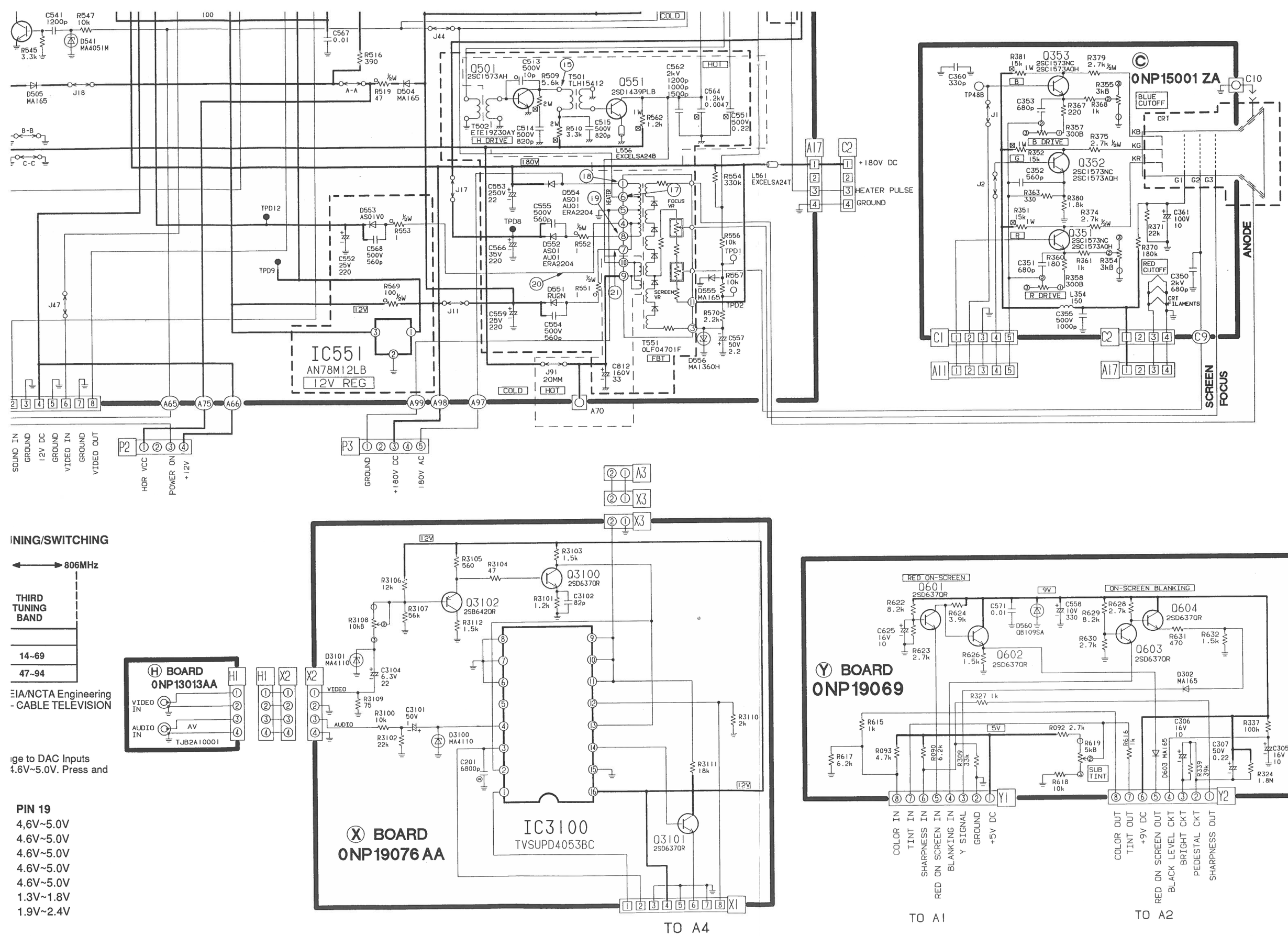


A, C, H,

IMPORTANT SAFETY NOTICE

THE BOXED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE BOXED AREAS OF THE SCHEMATIC.




C541 1200p
R547 10k
D541 MA4051M
R545 3.3k
100
C567 0.01
R516 390
J44
COLD
D505 MA165
J18
A-A
R519 47
½W
D504 MA165
Q501 2SC1573AH
C513 500V 10p
R509 5.6k
T501 TLH15412
T502 ETE19Z30AY
H DRIVE
C514 500V 820p
R510 3.3k
C515 500V 820p
Q551 2SD1439PLB
C562 2kV 1200p 1000p 500p
HOT
C564 1.2kV 0.0047
C551 500V 0.22
R562 1.2k
L556 EXCELSA24B
180V
B-B
C-C
J17
TPD12
D553 AS01V0
C552 25V 220
C568 500V 560p
R553
TPD8
C553 250V 22
D554 AS01 AU01 ERA2204
C555 500V 560p
C566 35V 220
D552 AS01 AU01 ERA2204
R552
HEATER
FOCUS VR
SCREEN VR
R554 330k
L561 EXCELSA24T
A17
C2
+180V DC
HEATER PULSE
GROUND
R556 10k
TPD1
R557 10k
TPD2
D555 MA165
R570 2.2k
C557 50V 2.2
D556 MA1360H
T551 OLF04701F
FBT
TPD9
R569 100 ½W
12V
J11
J47
C559 25V 220
D551 RU2N
R551
C554 500V 560p
IC551
AN78M12LB
12V REG
J91 20MM
HOT
COLD
C812 160V 33
A70
A65
A75
A66
A99
A98
A97
SOUND IN
GROUND
12V DC
GROUND
VIDEO IN
GROUND
VIDEO OUT
P2
HOR VCC
POWER ON
+12V
P3
GROUND
+180V DC
180V AC
A3
X3
C360 330p
TP48B
J1
R381 15k 1W
Q353 2SC1573NC 2SC1573AQH
R379 2.7k ½W
B
R355 3kB
C353 680p
R367 220
R368 1k
R357 300B
B DRIVE
R375 2.7k ½W
R352 15k
G
Q352 2SC1573NC 2SC1573AQH
C352 560p
J2
R363 330
R380 1.8k
R351 15k 1W
R374 2.7k ½W
R
Q351 2SC1573NC 2SC1573AQH
R360 180
R361 1k
R354 3kB
C351 680p
R358 300B
R DRIVE
L354 150
C355 500V 1000p
C1
C2
C9
A11
A17
BLUE CUTOFF
CRT
KB
KG
KR
G1 G2 G3
C361 100V 10
R371 22k
R370 180k
RED CUTOFF
C350 2kV 680p
CRT FILAMENTS
ANODE
SCREEN
FOCUS
C10
©
0NP15001 ZA

NING/SWITCHING
806MHz
THIRD TUNING BAND
14~69
47~94
EIA/NCTA Engineering
- CABLE TELEVISION
ge to DAC Inputs
4.6V~5.0V. Press and
PIN 19
4,6V~5.0V
4.6V~5.0V
4.6V~5.0V
4.6V~5.0V
4.6V~5.0V
1.3V~1.8V
1.9V~2.4V
Ⓗ BOARD
0NP13013AA
VIDEO IN
AUDIO IN
AV
TJB2A10001
H1
X2
12V
R3105 560
R3104 47
R3103 1.5k
R3106 12k
Q3100 2SD637OR
Q3102 2SB642OR
R3107 56k
R3101 1.2k
C3102 82p
R3108 10kB
R3112 1.5k
D3101 MA4110
C3104 6.3V 22
VIDEO
R3109 75
R3100 10k
AUDIO
C3101 50V 1
R3102 22k
D3100 MA4110
C201 6800p
R3110 2k
R3111 18k
IC3100
TVSUPD4053BC
Q3101 2SD637OR
Ⓧ BOARD
0NP19076 AA
X3
X1
TO A4
RED ON-SCREEN
Q601 2SD637OR
9V
ON-SCREEN BLANKING
R622 8.2k
R624 3.9k
C571 0.01
C558 10V 330
R628 2.7k
Q604 2SD637OR
C625 16V 10
R623 2.7k
R626 1.5k
Q602 2SD637OR
D560 QB109SA
R629 8.2k
R630 2.7k
Q603 2SD637OR
R631 470
R632 1.5k
Ⓨ BOARD
0NP19069
D302 MA165
R327 1k
R615 1k
5V
R092 2.7k
C306 16V 10
R337 100k
R617 6.2k
R093 4.7k
R090 6.2k
R309 33k
R619 5kB
SUB TINT
R618 10k
R616 1k
D603 MA165
C307 50V 0.22
R339 39k
C305 16V 10
R324 1.8M
Y1
Y2
COLOR IN
TINT IN
SHARPNESS IN
RED ON SCREEN IN
BLANKING IN
Y SIGNAL
GROUND
+5V DC
COLOR OUT
TINT OUT
+9V DC
RED ON SCREEN OUT
BLACK LEVEL CKT
BRIGHT CKT
PEDESTAL CKT
SHARPNESS OUT
TO A1
TO A2

⑫ 1.6V p–p [5ms]

㉑ 164V p–p [20µs]

Schematic Notes

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value noted is inductance in µH.
4. Test point indicated by ⚲ , Test point but no pin ⚲
5. When arrows [➘➚] used connections are easily found along with direction of arrow.
6. **— (BOLD LINES)** Indicates the route of B+ supply.
7. This schematic diagram is the latest at the time of printing and subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND CONNECTION** and ⏚ indicates COLD GROUND CONNECTION.

Voltage Measurements

1. Voltage measurement:
   - AC input to Receiver is 120V. Gated rainbow generator connected to antenna of Receiver.
   - All video and audio controls set to normalized position.
     TV ANT mode
     Volume – MIN
   - Voltage readings are nominal and vary ±10% on active devices.
     Some voltage readings will vary with signal strength and picture content.
   - Supply voltages are all nominal.
2. Ground symbol ⏚ or ⏚ indicates ground lead connection of meter. **Caution: Incorrect ground connection will result in erroneous readings.**

Voltage Chart (All Models)

A–Board

Integrated Circuits (ICs)

IC001

1	5.3	27	5.3
2	0	28	5.3
3	4.2	29	0
4	12.0	30	5.3
5	0	31	0.1
6	5.0	32	4.2
7	5.2	33	0.7
8	5.3	34	0.1
9	0	35	0.8
10	0	36	5.3
11	5.3	37	2.5
12	0	38	2.6
13	0.1	39	5.0
14	0.1	40	2.6
15	0.1	41	2.5
16	0.2	42	5.3
17	0	43	5.3
18	5.3	44	2.2
19	5.3	45	2.3
20	0	46	0
21	1.9	47	5.2
22	4.3	48	0
23	0.5	49	5.3
24	0.2	50	5.3
25	5.3	51	0
26	5.3	52	0

IC101

1	0	27	2.2
2	7.1	28	2.0
3	0	29	2.9
4	0.7	30	2.9
5	0	31	2.6
6	2.1	32	2.5
7	4.2	33	2.1
8	2.4	34	5.0
9	6.1	35	2.8
10	1.4	36	2.8
12	7.9	38	7.1
13	2.2	39	3.4
14	5.6	40	4.0
15	7.3	41	2.7
16	8.3	42	3.3
17	1.5	43	8.9
18	1.5	44	5.3
19	5.0	45	5.4
20	1.9	46	5.3
21	3.8	47	0
22	2.6	48	4.3
23	2.6	49	7.3
24	6.3	50	7.3
25	3.2	51	7.3
26	0.5	52	3.3

IC201

1	11.8
2	5.3
3	0
4	0.1
5	8.1
6	8.3
7	0
8	8.3
9	18.7

IC451

1	12.3
2	7.1
3	6.2
4	0
5	6.0
6	6.0
7	25.8
8	1.6
9	1.3
10	0
11	14.0
12	26.2
13	5.2

IC551

1	15.7
2	0
3	11.8

IC801 ⏚

1	0.2
2	130.8
3	143.7
4	129.7
5	0

Transistors

Ref.	b	c	e
Q001	0	0.2	0
Q002	6.1	1.9	5.0
Q004	5.9	9.7	5.2
Q005	5.1	5.9	5.9
Q006	0.2	11.8	0.1
Q007	0.7	0.1	0
Q015	5.2	0	5.3
Q019	8.3	8.9	7.7
Q102	8.3	11.8	7.6
Q301	1.4	11.8	0.8
Q303	4.3	0	4.9
Q316	0.7	0	0
Q451 ⏚	0.6	0.1	0
Q501	0	78.3	0
Q533	0.4	4.2	0
Q541 ⏚	–0.2	4.3	0
Q551	0	135.1	–0.2

C–Board

Transistors

Ref.	b	c	e
Q351	5.1	122.8	4.9
Q352	5.1	122.6	4.9
Q353	5.1	124.3	4.8

X–Board

Integrated Circuits (ICs)

IC851

1	2.8	9	1.3
2	0.7	10	1.3
3	1.0	11	1.3
4	0	12	8.1
5	0	13	0.7
6	0	14	8.1
7	0	15	0
8	0	16	12.0

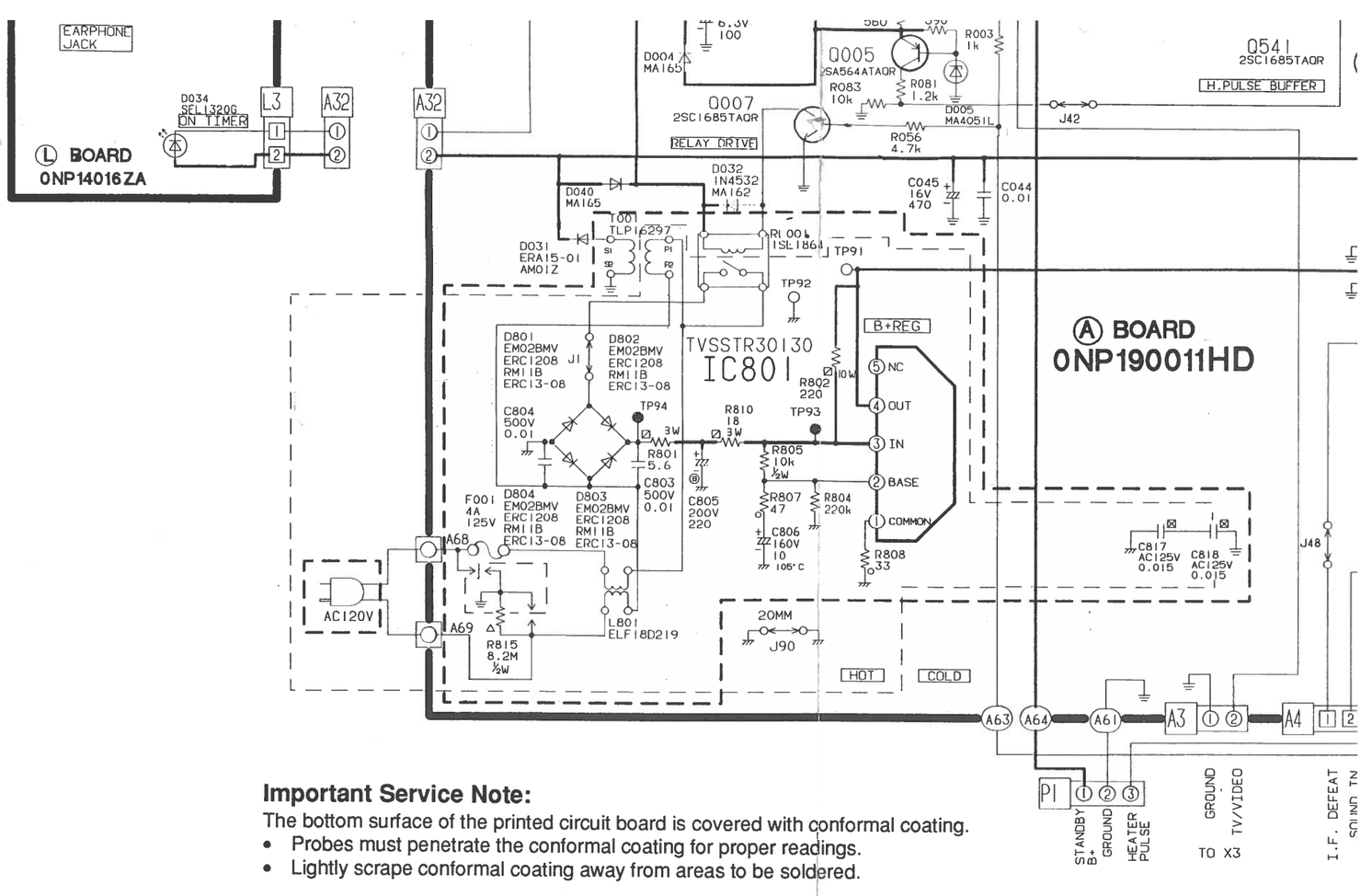
Transistors

Ref.	b	c	e
Q3100	1.3	0.7	2.0
Q3101	8.1	1.2	7.4
Q3102	10.0	1.9	10.7

Y–Panel

Transistors

Ref.	b	c	e
Q601	1.5	1.0	0.9
Q602	1.0	7.8	0.4
Q603	1.9	2.3	1.2
Q604	2.4	7.8	1.7



Important Service Note:

The bottom surface of the printed circuit board is covered with conformal coating.

- Probes must penetrate the conformal coating for proper readings.
- Lightly scrape conformal coating away from areas to be soldered.

Tuner Voltage Chart

U/V tuner voltage test points are located and designated on the circuit side of A–Board.
BP 5V BM 12V AGC 7.5V

Enable, Data, and Clock have no DC readings. They are digital signals from the MPU.
NOTE: Voltage at the 30V test pin varies with channel selection. Please refer to correct chart depending on TV/CATV(CABLE) switch position.

TV Position

	CH	VOLT	CH	VOLT	CH	VOLT
VHF	2	3.7	25	10.7	48	16.4
	3	4.6	26	11.0	49	16.7
	4	5.7	27	11.3	50	16.9
	5	7.8	28	11.5	51	17.2
	6	9.0	29	11.8	52	17.5
	7	7.3	30	12.0	53	17.8
	8	7.8	31	12.3	54	18.1
	9	8.3	32	12.5	55	18.4
	10	8.8	33	12.8	56	18.7
	11	9.4	34	13.0	57	19.1
	12	9.9	35	13.3	58	19.4
	13	10.4	36	13.5	59	19.8
UHF	14	7.7	37	13.7	60	20.2
	15	8.0	38	14.0	61	20.6
	16	8.3	39	14.2	62	21.0
	17	8.6	40	14.5	63	21.5
	18	8.8	41	14.7	64	21.9
	19	9.1	42	14.9	65	22.4
	20	9.4	43	15.2	66	22.9
	21	9.7	44	15.4	67	23.5
	22	9.9	45	15.7	68	24.1
	23	10.2	46	15.9	69	24.7
	24	10.5	47	16.2		

Cable Position

	CH	VOLT	CH	VOLT	CH	VOLT	CH	VOLT
CABLE	01	6.7	26	12.2	51	4.2	76	10.6
	02	3.8	27	12.7	52	4.4	77	10.9
	03	4.7	28	13.1	53	4.7	78	11.2
	04	5.7	29	13.5	54	4.9	79	11.4
	05	7.8	30	14.0	55	5.1	80	11.7
	06	9.1	31	14.5	56	5.3	81	11.8
	07	7.3	32	14.9	57	5.6	82	12.2
	08	7.9	33	15.5	58	5.8	83	12.4
	09	8.4	34	16.0	59	6.1	84	12.7
	10	9.0	35	16.5	60	6.3	85	12.9
	11	9.5	36	17.1	61	6.6	86	13.2
	12	10.0	37	17.7	62	6.8	87	13.4
	13	10.4	38	18.3	63	7.1	88	13.7
	14	18.2	39	19.1	64	7.4	89	13.9
	15	22.0	40	19.8	65	7.6	90	14.1
	16	3.9	41	20.6	66	7.9	91	14.4
	17	4.3	42	21.5	67	8.2	92	14.6
	18	4.7	43	22.5	68	8.5	93	14.9
	19	5.2	44	23.7	69	8.7	94	15.1
	20	5.6	45	24.9	70	9.0	95	10.2
	21	6.3	46	26.3	71	9.3	96	12.0
	22	6.8	47	3.5	72	9.5	97	13.4
	23	10.9	48	3.7	73	9.8	98	14.8
	24	11.3	49	3.9	74	10.1	99	16.5
	25	11.8	50	4.1	75	10.4		

MICROPROCESSOR PROGRAMMING FOR BAND TUN

54MHz ◄► 130MHz ◄► 360MHz ◄

	FIRST TUNING BAND	SECOND TUNING BAND	T
VHF	02~06	07~13	
UHF			
CABLE	01~06,14,15,95~99	07~13,16~46	

NOTE: CABLE channel numbers as recommended by the joint EI Committee and published as EIA INTERIM STANDARD NO. 6 – C CHANNEL IDENTIFICATION PLAN – MAY 1983.

The Functions listed below are activated by a DC voltage change (Pin 18 and 19) of MPU IC001. Pins 18 and 19 are normally 4.6 hold function button on Receiver to take voltage readings.

FUNCTION	PIN 18	F
POWER	0V~0.6V	4
VOL ▼	0.7V~1.2V	4
VOL ▲	1.3V~1.8V	4
CH ▼	1.9V~2.4V	4
CH ▲	2.6V~3.0V	4
MENU	4.6V~5.0V	1
TV/VIDEO	4.6V~5.0V	1